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The AUTOMOBILE

Fig. 1—View of the lunchroom of the Pierce-Arrow Motor Car Co., Buffalo, N. Y., at noon hour

Industrial Betterment Show

Charts Portray Advance in Better Relations Between Employer and Employee—Better Pay, Shorter Hours and Bigger Production

By J. Edward Schipper

NEW YORK CITY, April 25—Today there closed in this city an exhibit which might be said to mark an epoch in the development of the human factor in industry. Under the title of an Exhibit of Better Industrial Relations this display of concrete evidence showing the advance and promotion of industrial harmony had for its object the showing of those activities in industry which recognize the human factor and better the conditions of employment and the relationship between employer and employee. It was held under the auspices of the Business Men's Group of the Society for Ethical Culture.

The exhibit divided itself naturally into four parts. Part I was devoted to relations between employer and employee, Part II to work designed primarily to improve physical conditions in individual establishments. Part III to industrial education and Part IV to activities carried on by associations of employees with or without the participation of employers.

The part of the exhibit showing the betterment of direct relations between the employer and employee was illustrated by examples in which the employees take a direct part in the management of the affairs of the concern; often by actually increasing the output of a factory, while at the same time the wages of the employee are increased and many hardships lessened.

Moving Pictures Teaching Industrial Lessons

A large room in which a screen was fitted up was devoted to illustrating the industrial lessons of the exhibit more forcibly by the use of the moving picture machine. Every hour a series of these pictures was run off, driving home the necessity for adequate fire protection, etc.

Another interesting room at the exhibit was fitted up as a suggestion for a hospital room. In this many appliances were shown for hospital or first aid treatment, while around the room were photographs illustrating the factory hospital of the Norton Grinding Co., and the rest rooms used in such concerns as the Larkin Co., Pierce-Arrow, Marshall Field, Lord & Taylor, Ferris Bros.

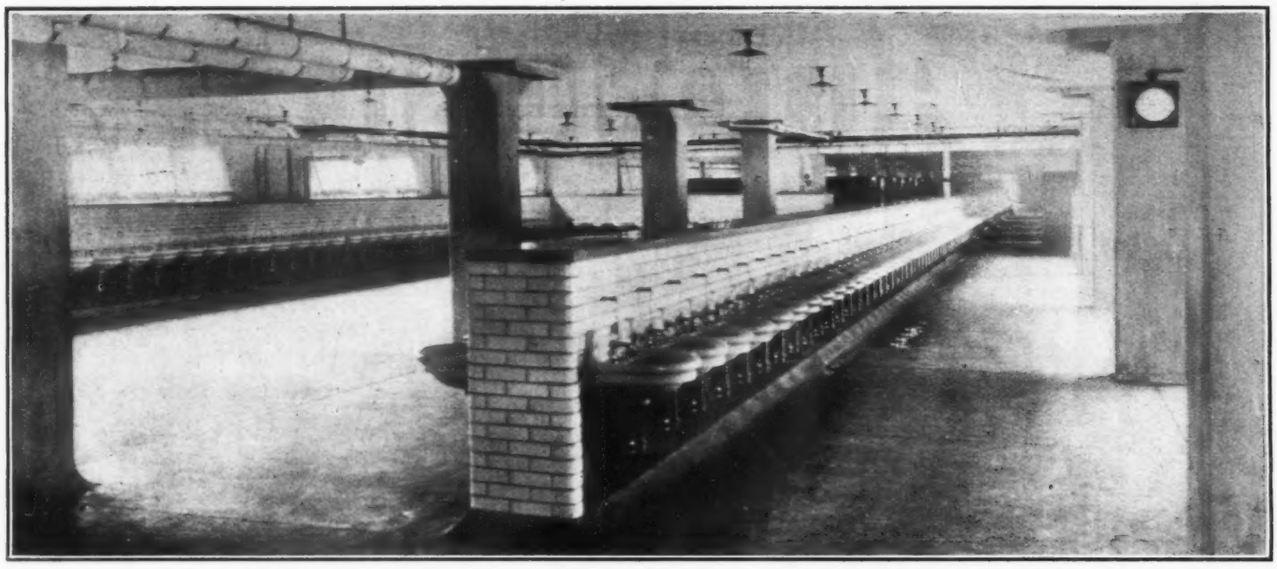


Fig. 2—Lavatories in the plant of the Pierce-Arrow Motor Car Co. for use of the employees

During the week more than 2,000 visitors representing all industries attended the exhibit. Sixty interested students from Princeton University called to inspect the charts and photographs, and 100 from New York University. The visitors to the exhibit filled out cards, giving the industry with which they were connected and by this method the management has kept an accurate account of the people who are sufficiently interested to call and inspect the exhibit. These are exceedingly well scattered and do not favor any one business more strongly than others, showing the exhibit to be of interest to all classes.

Employees Have a Voice

The advantage of joint boards of control was shown. The exhibit illustrated what has been done by this method in the way of sanitary control and other general labor conditions. The division of control is shown very well in the chart, Fig. 9, illustrating a joint board of sanitation, organization, functions and method of work.

As noted, the board has prime control. It is made up of employers and employees and manages its rules through a director. This director divides his organization into four general heads: Sanitary work, fire, and education, the functions of each being shown in the chart.

Employees Have an Interest

The prime method of giving the employee an interest is in the stock ownership by employees. Three schemes of arranging this condition of affairs were shown, by direct purchase, as a bonus for good work or by profit sharing. An example where direct purchase is possible is the U. S. Rubber Co., where stock can be bought by employees at a discount. In the Du Pont Powder company, it is given as a reward for good work in the form of a bonus, while in concerns like the U. S. Steel Corp., the stock is given the employees on a profit-sharing basis. In the National Biscuit Co., one-third of the preferred stockholders are employees while two-thirds are outside investors and company officers. In the Du Pont company, 45 per cent. of the stockholders are employees and 55 per cent. non-employees.

Employees Make Suggestions

One of the most interesting features of the exhibit was in the results accomplished by the co-operation of the employee by making suggestions. The exhibit shows nineteen companies of large size where the suggestion system has been

Fig. 3—Safety fireproof door to stock room used in Kops Bros. plant. The use of these doors permits of a quick exit easily operated and yet cuts off the fire from fire escape

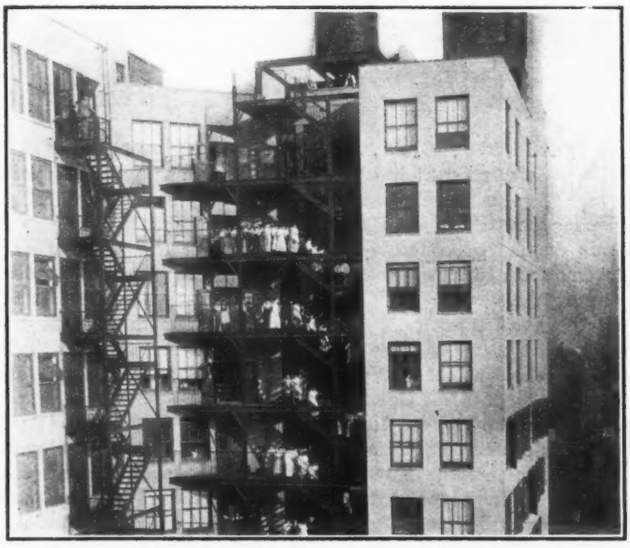


Fig. 4—Fire drill for female employees in Kops Bros. factory. Periodic drills of this nature increase the rapidity of exit by 100 per cent. and besides, prevent panics

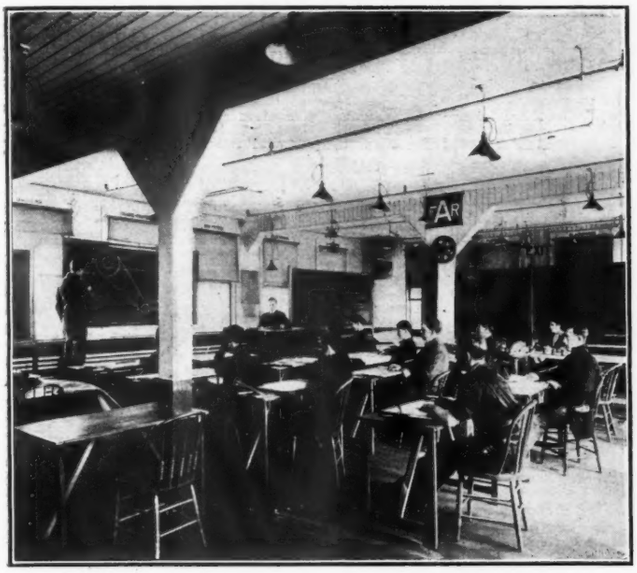


Fig. 5—Apprentices at work in a class of arithmetic operated by the Fore River shipyard

Fig. 6—Rest room operated in connection with Larkin factory

carried out to such an extent that valuable reductions in costs or savings in other directions have been accomplished.

The general system for working the suggestion scheme is to have a definite method of submitting the suggestions either by written form through a suggestion box posted somewhere in the factory, or by personal interview with department heads or members of the firm. When a suggestion is taken up it is generally decided on by the employer and heads of departments or by committees of employees. Acceptance of a suggestion generally carries with it an award which may be a small amount of cash for each suggestion used, or may be a share in the profits resulting from the use of the suggestion.

For instance, A. B. Chase & Co., piano manufacturers, patent the valuable improvements and inventions, giving the originating employee a half-interest in the profits resulting therefrom.

The National Cash Register Co., Dayton, O., received 6,000 suggestions from employees last year. Of these 2,000 were adopted and by their use $30,000 was saved to the company. The National Cash Register Co. pays $1 for each suggestion adopted and in addition pays $500 in quarterly prizes. This company presents a medal to each of the employees winning one of the prizes and also awards them a certificate showing that they are recipients of the prizes. In addition to the medals, the company will award in July 1914, one prize of $100, three prizes of $50, ten prizes of $25, fifty prizes of $10, and 100 prizes of $5, making a total of $1,500. Prizes are open to all making, recording and selling forces with the exception of members of the officers' school and employees of the advertising and sales departments. The suggestion may pertain to health, safety, welfare, convenience, improvement in product or equipment, simple methods, etc.

Settlement of Industrial Disputes

There were four subdivisions exhibited, entitled Voluntary Agreements, Methods in America, Methods in Europe and Compulsory Arbitration.

Under the head of Voluntary Agreements, a chart showing the methods of the Anthracite Conciliation Board was given. In a case of grievance between the workers and employers the disputes are generally settled by either the mine foreman, superintendent, workers' boards or employers' board. Should the workers' board and employers' board fail to come to an agreement, the case will reach a board of six composed of one representative of each side from each of the three districts. In case of a deadlock, the case is settled by an umpire appointed by the U. S. Government.

Fig. 7—Racks for motorcycles and bicycles used by employees in coming to work at the Pierce-Arrow plant

Fig. 8—Before and after belt guard installation at Norton factory

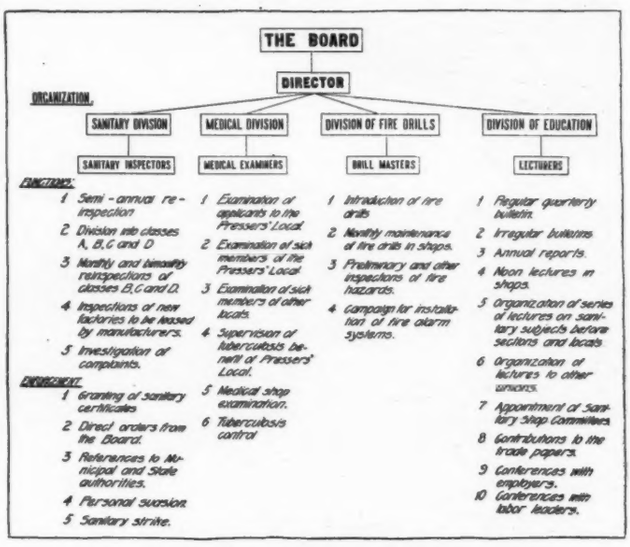

THE BOARD
DIRECTOR
ORGANIZATION
SANITARY DIVISION
MEDICAL DIVISION
DIVISION OF FIRE DRILLS
DIVISION OF EDUCATION
SANITARY INSPECTORS
MEDICAL EXAMINERS
DRILL MASTERS
LECTURERS
FUNCTIONS:
1 Semi-annual re-inspection
2 Division into classes A, B, C and D
3 Monthly and bimonthly reinspections of classes B, C and D.
4 Inspections of new factories to be leased by manufacturers.
5 Investigation of complaints.
1 Examination of applicants to the Pressers' Local.
2 Examination of sick members of the Pressers' Local.
3 Examination of sick members of other locals.
4 Supervision of tuberculosis benefit of Pressers' Local.
5 Medical shop examination.
6 Tuberculosis control
1 Introduction of fire drills
2 Monthly maintenance of fire drills in shops.
3 Preliminary and other inspections of fire hazards.
4 Campaign for installation of fire alarm systems.
1 Regular quarterly bulletin.
2 Irregular bulletins.
3 Annual reports.
4 Noon lectures in shops.
5 Organization of series of lectures on sanitary subjects before sections and locals.
6 Organization of lectures to other unions.
7 Appointment of Sanitary Shop Committees.
8 Contributions to the trade papers.
9 Conferences with employers.
10 Conferences with labor leaders.
DUTIES:
1 Granting of sanitary certificates
2 Direct orders from the Board.
3 References to Municipal and State authorities.
4 Personal supervision
5 Sanitary strike.

Fig. 9—Joint board of control of internal affairs

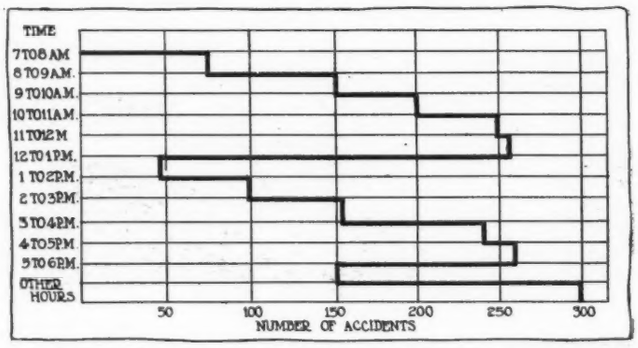


Fig. 10—Relation of fatigue to accident, accident-hours, Illinois, 1910

In America the methods of settlement under the Canadian Industrial Dispute act of 1907 or the Erdman Act of 1898 or under the State Laws of New York of 1886 were illustrated. These are generally invoked in case the workers and employers bring their dispute before the Labor Department, which in this country is represented by the Labor Chairman of the Interstate Commerce Commision. From this source the dispute is carried to the board of arbitration, consisting of three members, a representative of the workers, a representative of the employers, a representative of the general public appointed by the first two members. In case of an appeal from this decision the appeal is carried to the Government Court of Appeals. The results obtained by this were shown in forty-five cases where thirty-six were settled by the mediation board, eight settled by arbitration and one not settled.

Increased Earnings Through Efficiency

Increased earnings, due to better industrial efficiency, formed an interesting feature of the exhibit. A chart, Fig. 12, was shown in which the effect of the bonus system on automatic screw machine work was illustrated. The Fred Stearns company states that about 10 to 15 per cent. increase in wages resulted by the use of the bonus system and the Providence Engineering Works asserts that, by the use of the premium plan, wages were increased from 15 to 20 per cent. The advantages charted at the exhibit for the premium or bonus system were: time saved, additional output, superior product and other [psychological] improvements. It was stated that the success of the premium or bonus system depends on fair time-setting on a job, without frequent change. The employer's part is in the increase of the wages through efficiency of the employee but this work cannot be accomplished by the workmen alone and must have the co-operation of a strong and efficient management.

Determining the Minimum Wage

There are three methods of determining what the minimum wage should be. First, by the individual employer, second, by agreement with unions and third, by state laws. A striking illustration of the decision by the individual employer is that made by the Ford Motor Co., in which all the employees over 21 years of age were put on a minimum wage basis of $5 per day. In the cotton milling industry the agreement as to minimum wage is made with the unions and in California, Colorado, Massachusetts, Minnesota, Nebraska, Oregon, Utah, Washington and Wisconsin the minimum wage is determined by state law, this of course applying to women and minors. In the State of Washington the minimum wage for women is set at $10 a week.

Seasonal unemployment affects hundreds of thousands of laborers in slack seasons. While the exhibit did not show directly any reference to the automobile industry, statistics were brought out at the exhibit illustrating the advantages of having a steady output rather than one which fluctuates at different seasons of the year. In one concern in shoe manufacture where business was once seasonal it was possible to spread the production evenly over the year by arranging sales as well as by alternating types of shoes made.

Motor car manufacturers very often concentrate their heavy production into a few months and this makes a very comparable example. The efforts of trade unions to lessen seasonal unemployment have resulted in much good in many of the industries with the result of lessening over-time work and thus spreading the steady work farther through the year.

Wasted Money Through Unemployment

It costs $5 to connect each manless job and jobless man in the State of New York. In Massachusetts it costs $1.04, Illinois 71 cents, Wisconsin 35 cents, Ohio 28 cents, Munich 20 cents, Frankfort 13 cents, Cologne 9 cents and Washington 4 cents. In the twelfth U. S. census there were 3,200,000 workers idle from 1 to 3 months time with an estimated loss of $200,000,000. There are 2,500,000 idle from one quarter to one-half a year with an estimated loss of $500,000,000, and 735,000 idle from 6 to 12 months with an estimated loss of $300,000,000. This means 6,500,000 working people unemployed during some part of the 12 months and a total loss at $10 a week of $1,000,000,000 per year. This brings out strongly a point where money can be saved. A poster at the exhibit asked: "Why not free labor exchanges throughout the State of New York?"

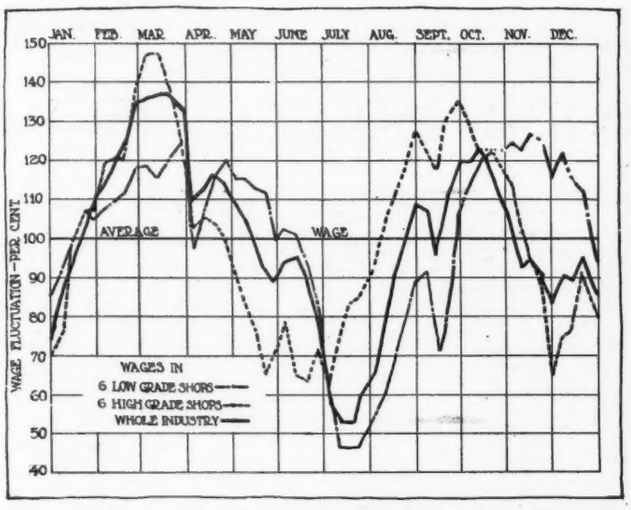

JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
WAGE FLUCTUATION—PER CENT
AVERAGE WAGE
WAGES IN
6 LOW GRADE SHOPS
6 HIGH GRADE SHOPS
WHOLE INDUSTRY

Fig. 11—An example of seasonal fluctuation—dress and waist industry

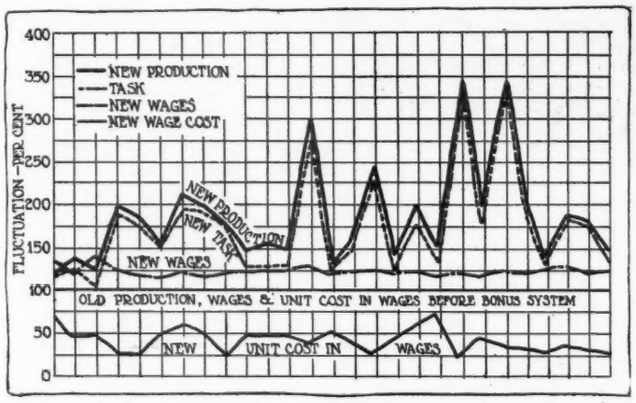


Fig. 12—Lower costs has effect of bonus system on automatic screw machine work

There was a poster which stated, "We take men from the industrial scrap heap and return them to the ranks of productive labor." Many examples of interesting work were shown by those who were once discarded as physically unfit to carry on their work now working in other industries.

Under the head of savings and loans, many of the examples of work done to rescue the working man from the clutches of the loan shark were shown. This work has been vigorously pushed and the exhibit illustrated some effective results accomplished by concerns who have taken it up.

Greater Output in Less Time

It was shown at this exhibit that the output has actually been increased in many cases by the raising of wages and shortening of time, due to the greater energy of the worker.

Industrial pensions and the advantage of putting these to the expense of the worker as compared to compensation by the companies themselves were illustrated.

The evils of monotonous occupations were brought out by charts showing a boy fresh from school working at a machine and comparing it with the man 20 years later. He has been working at that same machine during all this time and yet it is found that in spite of the 20 years' experience the man turns out less and inferior work to what he originally did. The methods of lessening this evil suggested by the exhibit are, shorter hours, rest periods, education, elimination of hand work by superior machinery and reorganization.

Part II of the exhibit, devoted to hygiene, safety, etc., illustrated the advanced methods now employed in modern

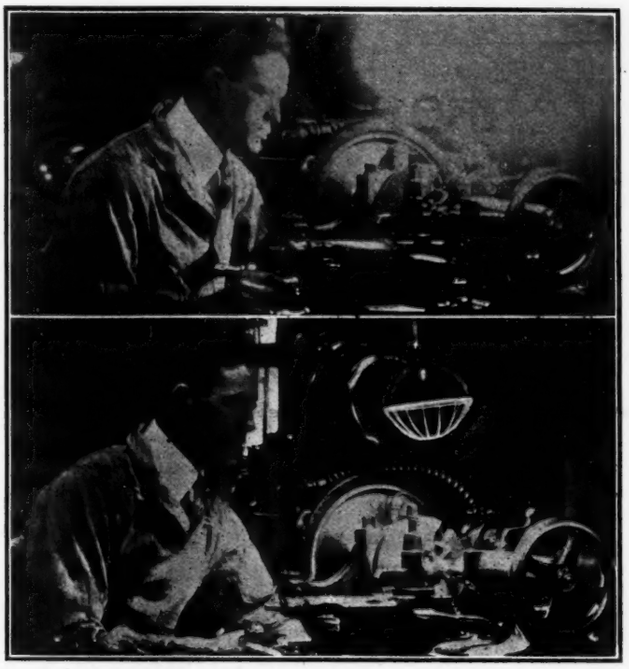


Fig. 13—Wrong and right methods of illuminating a lathe

factories for cutting down the loss of life and injuries due to overlooking the essential elements of protection for the worker. In dusty trades this was illustrated by the installation of suction devices, dust hoods, nose and mouth protectors, etc.

The prevention of fatigue was also brought out, especially as regards children. The difference between the mill child and the normal child was a particularly striking illustration.

Safety fire protection and advanced methods of arranging fire escapes and guards in testing rooms, forge shops and woodworking machine shops, etc., were shown. The American Museum of Safety, 25 West Thirty-ninth street contributed largely to the exhibit and furnished photographs showing actual installations of safety devices in such plants as the J. H. Williams Co., Brooklyn, Pierce-Arrow Motor Car Co., Buffalo, Norton Grinding Machine Co., Worcester, etc.

A striking result of installing ventilating plants is shown by the Carrier Air Conditioning Co. of America, which after 8 hours of operation, had removed six pails of dust, dirt and lint from the operating room of a mattress factory.

Illustrating the elements of sanitation, the wide aisles, lavatories and light and airy buildings formed the principal features shown. The Pierce-Arrow company's work in this direction was illustrated by views of the floors of different buildings showing the cleanly arrangement of the factory, the assembling room, etc. There were also views of fire drills in such concerns as the New York Telephone Co., and Kops Bros.

Educational Campaigns Pushed

Education conducted by employers, the apprentice and by schools in many of the large manufacturing works were exhibited. Extensive views illustrated the schemes used by the General Electric Co., the Cadillac Motor Co., National Commercial Gas Assn., Curtis Publishing Co., New York Telephone Co., etc.

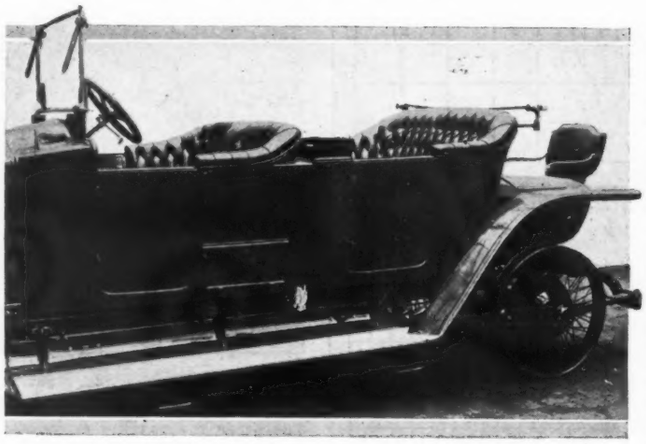
In the General Electrical Co's. school in Cincinnati in 1 year 717 men were graduated. Of these, 464 were machinists, ninety-nine moulders and core makers, twenty-nine pat-

(*Continued on page* 938)

Refinements in French Body Design

Invisible Folding Chauffeur's Seat—Baggage-Carrying Facilities—New Types of Tops and Windshields—An All-Weather Car

PARIS, FRANCE, April 20—Increased comfort and the removal of the chauffeur from the most important seat on the car are the advantages claimed for the latest type of touring body produced by Kellner. The main seats are brought within the axles, and at the rear is a rounded top deck within which is carried a folding chauffeur's seat. Closed down, this seat is invisible, and when opened out it gives a reasonable amount of comfort. Within the deck, and to left and right of the chauffer are a couple of tool lockers. The mechanician thus has all necessary tools close to hand, and yet these tools can be reached from the outside of the car without any difficulty. As the gasoline tank is mounted in the scuttle dash, a suit case locker is built under the front seats. The case slides out on rails from the left side.



Kellner torpedo with disappearing top and collapsible chauffeur's seat mounted at the rear

An original type of top is fitted. It consists of a canvas top fastened at the front to the top of the windscreen and at the back to a cross member secured on a couple of pivotable uprights. Storm curtains with upright oblong mica panels are clipped to the inside of the top and to the outside of the body panel. Top and side curtains can be detached and placed in a shallow locker at the back of the front seats. The top of this locker forms a table the full width of the car. The rear supports for the top, being hinged at their base, fold down at the back of the body, merely forming a brass rail in front of the chauffeur's seat its appearance being illustrated above.

The side lamps are built on the top of the scuttle dash and have a casing around them with a hinged glass front. This protects the electric light bulbs but does not render them inaccessible.

Complete protection for the rear passengers has been

Upper left—Side lights on Renault radiator. Upper right—Kellner body with top and storm curtains up; also collapsible chauffeur's seat. Lower left—Cabinet at back of front seat receiving top. Lower right—Compartment for trunk under front seat

Left—Alin and Liautard body with rear scuttle and windscreen for rear passengers. Right—Rear scuttle raised, showing chest

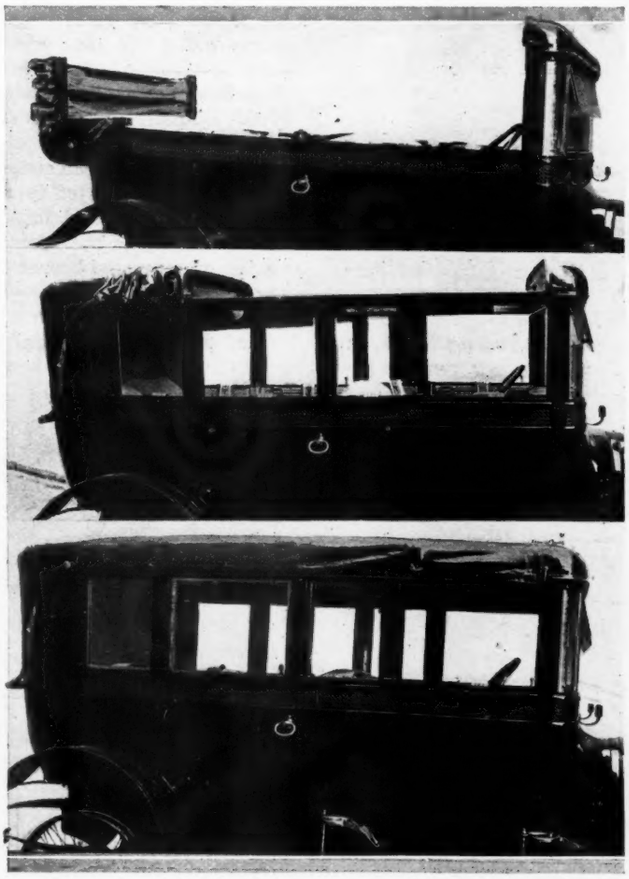
sought in the Alin & Liautard body shown in the illustrations. At the back of the front seat, and equal in depth to the width of the side doors is a hinged scuttle or deck with a windscreen hinged to its rear edge. When lowered, this deck completely protects the lower portion of the bodies of the passengers, and with the windscreen up they are shielded from draughts. The deck is held down to the side doors by quick acting clips, and has a rug rail along its rear edge. The windscreen being hinged at its base can be placed at any angle by the operation of a single screw, and when its protection is not required can be laid flat on the deck.

As the use of the deck makes impossible additional folding seats, the bodymakers have fitted a handsome set of drawers to the back of the front seat and under the deck. The rear face of this chest of drawers is profiled so as not to interfere with passengers' leg room.

The lines of the car are enhanced by giving the rear side doors a gentle tumblehome into the deck. The side lamps are of the swivelling eye type let into the scuttle. The top is secured to the windscreen, thus abolishing the use of straps.

An All-Weather Body

All the advantages of the saloon car with the agreeable features of the open touring body are claimed for the all-weather car produced by Alin & Liautard, one of the leading French bodymakers. The body is opened by first of all sliding back the leather roof, this being facilitated by the top of the window frames having a rail mounted on them. The back is then folded down in the usual way, the leather roof going with it. The window frames and the front portion of the body remain. The uprights of the frames are hinged at their base, one pair folding down on the back of the front seats, and the second pair folding into a recess in the upholstery, where they are held by pressure buttons. The front is of the D type, its uprights being fixtures, and the front portion of the roof, immediately above the windscreen also being a fixture. This short portion of roof is a cupboard into which the top members of the window frames are placed and are hidden from view by the door of the locker. The windscreen is in two parts, each one being hinged. As an open car, this body has a fixed front with adjustable windscreen in it.



Top—All-weather Alin and Liautard body fully open. Middle—Same body with top pushed back. Bottom—Fully closed

One of the points to be considered in windshield practice is the joining of the top of the windshield with the top of the car in order to prevent the draft which is generally set up and which sweeps along the top and then behind the back of the passengers. By not permitting an opening at this point practically all the draft that would ordinarily be found within the car will be eliminated. With the ordinary type of windshield there is such a rush of air between the windshield and the top that passengers find the car warmer with the top down and the windshield up than it is with both the top and windshield in position.

The fitting of a secondary windshield for the tonneau will not obviate the draft difficulty if the first or front windshield is not a tight fit with the top. With the top down and the double windshield fitted, however, the draft is so well baffled that it is scarcely felt.

Making and Testing Ball Bearings

New Plant of Hess-Bright Mfg. Co. Employs 175 Men —Great Accuracy a Feature

FROM the point of view of friction elimination no better method of supporting a revolving shaft than the ball bearing has yet been devised. To eliminate friction, however, is not the only desirable feature of the perfect bearing. It must possess strength in proportion to the space it occupies besides showing wear-resisting qualities and it is in these directions that the development of the ball bearing has tended during recent years. It can now claim consideration for specific uses that formerly only the older solid type of bearing was thought practicable.

The increasing adoption of the ball bearing in the make-up of the automobile chassis is a strong pointer to its merits for there is no more thorough test for accuracy and strength than the modern motor car. Present-day demands in this connection are severe.

As an indication of the success of the industry it is of interest to state that one of the important ball bearing concerns of this country turned out during 1913 over 600,000 bearings. The concern referred to is the Hess-Bright Mfg. Co., Philadelphia, employing 175 men, which has recently moved into the large new plant, Fig. 4. The new buildings occupy a space adjacent to the Pennsylvania railroad and cover an area of 42,000 square feet. The whole of this ground floor is the factory proper while the upper floor of the main building in front is devoted to the offices. Since the shops are all on the ground the lighting by means of the saw tooth type of roof extending over the whole of it is ideal. The windows face north.

Fig. 1—Showing the range of manufacture of Hess-Bright bearings

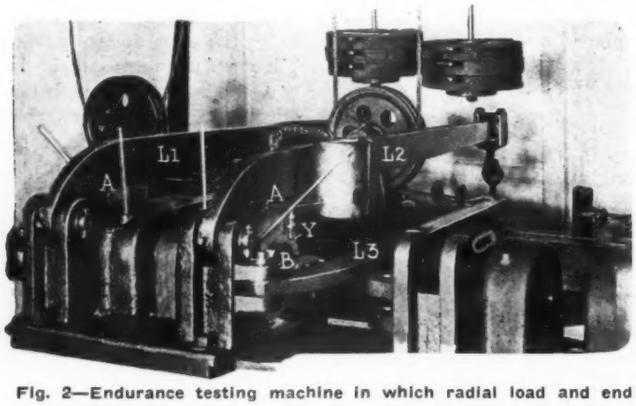


Fig. 2—Endurance testing machine in which radial load and end thrust can be applied continuously to the running bearing B

Parts Imported from Germany

The Hess-Bright bearing is an imported bearing and therefore some explanation of the uses of this large plant may not be out of place. A ball bearing consists of four essential parts. 1, the outer ring containing a groove inside to act as a path for the balls; 2, the inner ring with a corresponding external groove for the same purpose; 3, the balls themselves and 4, the cage which surrounds the balls and keeps them in position. Some of the bearings turned out by the Hess-Bright company are sent complete from the bearing plant of the Deutsche Waffen Fabrica in Germany which employs 5,000 workers and has a capacity of 10,000 bearings a day, but most enter the Philadelphia factory in parts for assembly. The balls are imported in a finished condition but the rings are rough-turned and hardened only and require grinding before passing to the assembly department. The cage, consisting of a pressed bronze casting, is made in the American plant.

An important function of the plant is the thorough testing of every bearing passing into the market and the equip-

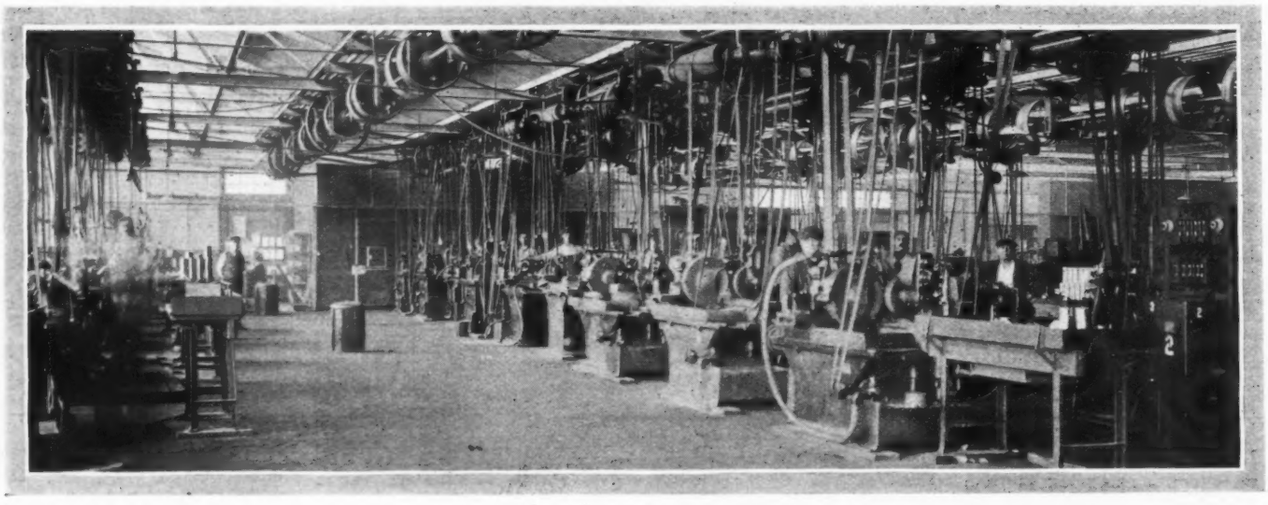


Fig. 3—Bank of grinders in the new Hess-Bright plant. All overhead shafting is supported on H-B ball bearings

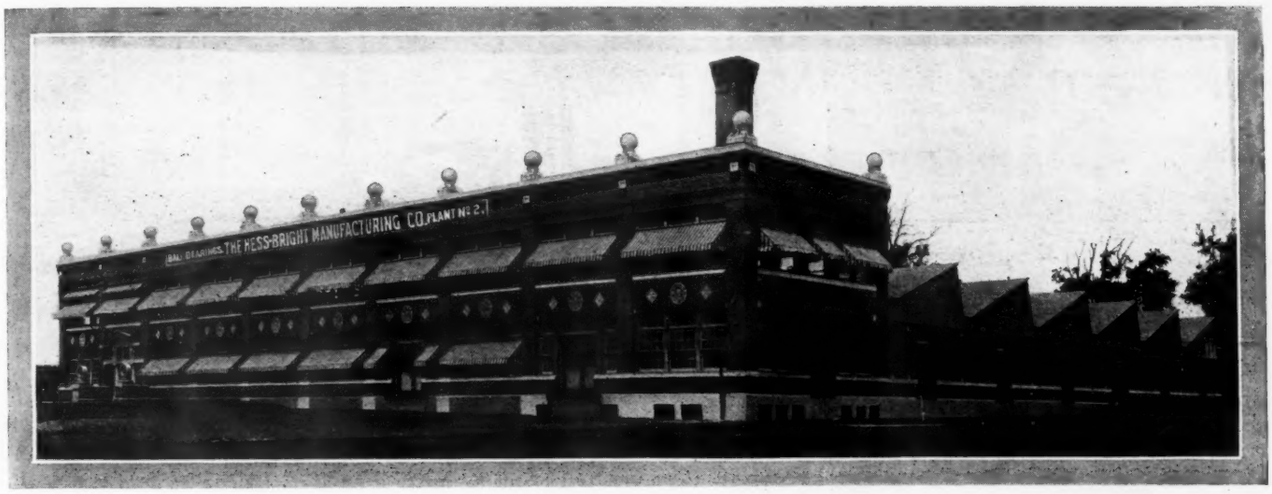


Fig. 4—The new ball bearing plant of the Hess-Bright Mfg. Co. at Philadelphia

ment for this purpose is complete and up-to-date. A repair department is also one of the increasing activities of the concern. Here worn bearings are received and put into shape so that the result is actually a new bearing at a cost of approximately one-quarter of the original price. This is a possibility of ball bearings not generally realized and one which this manufacturer is making efforts to encourage among dealers and automobile owners.

Grinding the Rings

Dealing with the processes that take place in the factory that of grinding the imported rings is one of the most important. The grinders occupy the largest part of the shop floor, Fig. 3 and are of the type shown in Fig. 6. Each ring passes through two machines, the first being the rough grinding and the second the fine finish grinding. Several days are allowed to elapse between these two processes as it has been found that this rest improves the quality of the resulting surface. In Fig. 6, G is the grinder and R the ring clamped on the faceplate.

The cage as used in one style of bearing consists of two similar hard bronze castings riveted together. These halves are prepared for assembly by pressing in the machine Fig. 5, in which the part A is forced down with great pressure on the cage placed in the yoke B. Absolute accuracy in the cupped faces of the cage is insured by the use of actual steel balls in the die A corresponding to those which will be used in the finally assembled bearing. The balls are slightly larger in diameter than the bearing is designed for so as to allow the minute clearance necessary for easy operation and lubrication. Any possible distortion in the casting is eliminated by this press and the surface of the cage which comes in contact with the balls is rendered exceedingly hard.

Assembling and Testing

Finished rings and cages are stored in the store room from where they are withdrawn by the assembly department, as required. In assembling, the balls are first placed in position between the outer and inner rings and the two halves of the cage applied and riveted together. In two-row bearings a distance ring is inserted between the rows of balls. Another type of cage, noticeable in Fig. 1 is that in which a single casting with projecting ears is used.

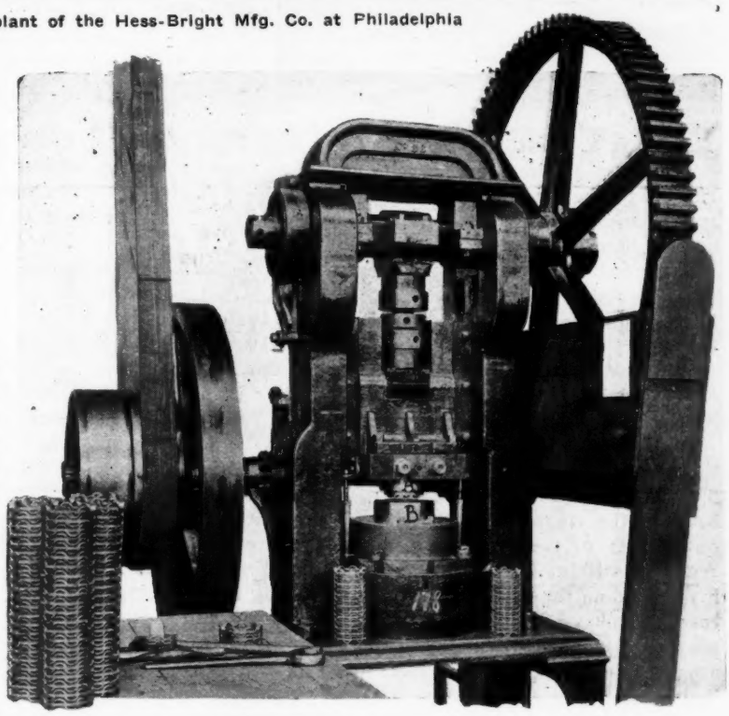


Fig. 5—Large press which finishes the bronze cages. A number of balls in the moving part A are forced down on the cage at B

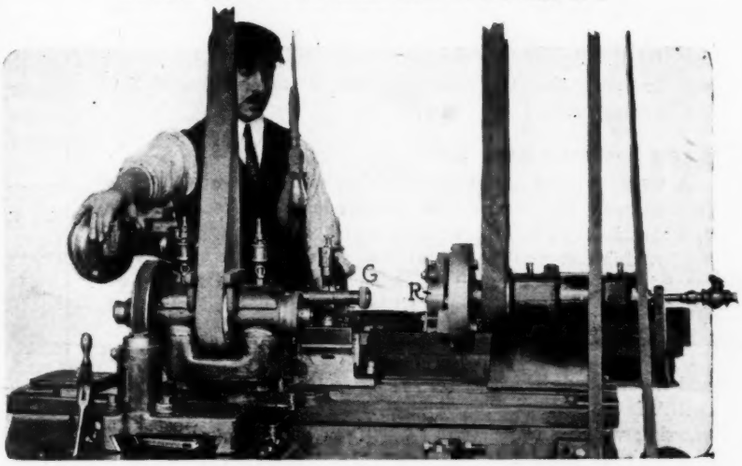
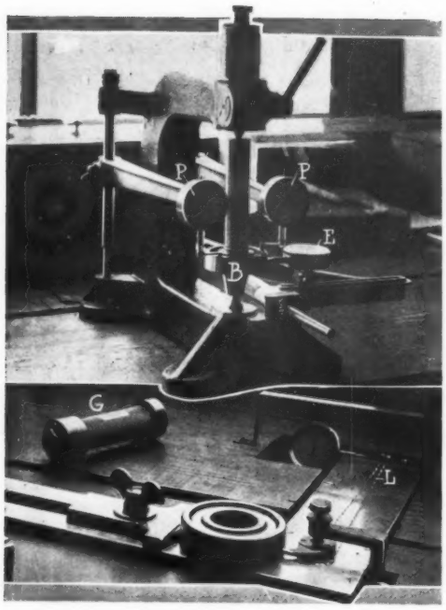


Fig. 6—Grinder in which the grooves for the balls are made. The ring is shown clamped to the faceplate at R and the grinding wheel at G



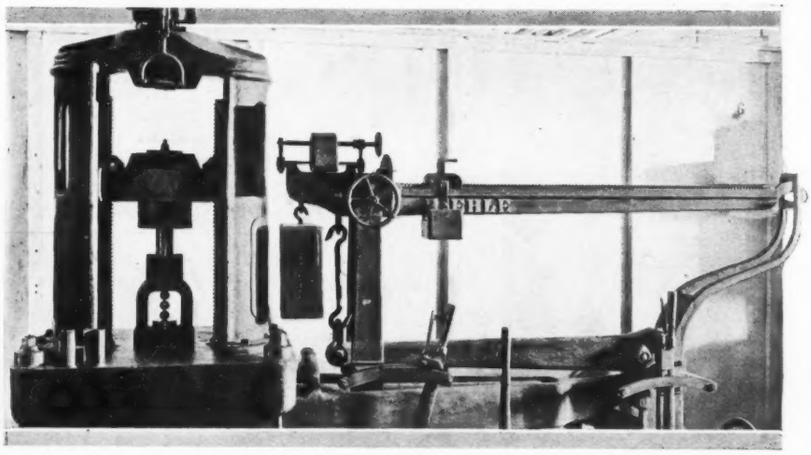


Fig. 7—Upper left, instrument for measuring eccentricity and end play of bearing. B is the bearing and P, P and E the dials which register to .0001 inch

Fig. 8—Left, below, How the external and internal diameters are measured. The lever L registers the external diameter on the dial. G is a plug gauge for inner bore

Fig. 9—Above, Riehl testing machine for showing quality of steel by breaking ball

These ears are bent over the balls after assembling in place.

To obtain perfect concentricity of inner bore and outer ring of the bearing the outer surface is given a final grinding after assembling, being centered on the inner ring. The outside diameter is tested in a sensitive gauge, Fig. 8. In this the bearing is passed between two jaws the movable one of which forms the short end of the lever L. Any inaccuracy in the diameter is registered on the dial at the other end of this lever, and as the lever is proportioned 10 to 1 readings within .0001 inch can be made although the dial is really calibrated in .001 inch divisions. The inner bore is tested by the use of a plug gauge G, Fig. 8.

Another interesting test which brings out the accuracy of the products of this concern is the instrument Fig. 7. This has three functions. It records: 1, any existing endplay between the rings, 2, eccentricity of the inner ring and 3, eccentricity of the outer ring, at one setting and with an accuracy within .0001 inch. The bearing being tested, B, is mounted on the vertical arbor corresponding to its internal bore and placed between the two points at top and bottom of the instrument. The eccentricity gauge E is adjusted at one side and the two endplay dials P swung over with their registering plungers resting on the side of the outer ring. By attempting to oscillate the outer ring across its axis the endplay is registered on the dials P. By holding the inner ring stationary on the arbor and rotating the outer ring any eccentricity in the outer ball groove is shown on the dial E. By holding the outer ring stationary and revolving the inner ring the same dial records any eccentricity of the inner groove.

Severe Endurance Tests Made

A well-equipped experimental laboratory is always in use. In this room endurance tests are made in the machine Fig. 2, which is capable of providing more severe conditions than the bearing can meet in actual use. The machine consists essentially of a strong shaft which can be rotated at any desired speed and two levers L1 and L2 arranged about it, one to apply pressure radially and the other along the axis. To test a bearing B it is placed first in a heavy steel yoke Y and mounted on the shaft. At the top of this yoke a steel ball A is interposed between the yoke and the lever L2. By hanging weights on the end of the lever a great radial pressure can be applied to the bearing through the ball.

In a similar manner end thrust is applied through the lever L3 which bears on the outer ring of the bearing while the inner is rotating on the shaft. The weight at the end of the thrust lever is connected by means of cable and pulleys.

During the test the conditions prevailing are identical with those for which the bearing is designed as far as speed and lubrication are concerned. The radial load, however, to which it is subjected far exceeds its rating or any possible load to be met in subsequent use. Three times the normal rate is a common test. While running, frequent readings are taken from the thermometer inserted in the yoke.

The quality of the steel used for the balls is tested in the Riehl tester Fig. 9, in which three balls are placed in line and tremendous pressure applied until the center ball breaks. Examination of the broken surface reveals the condition of hardening.

Finished bearings are washed in kerosene, then blown with a high-pressure air nozzle and finally oiled and wrapped in waxed paper so that there is no danger of rust.

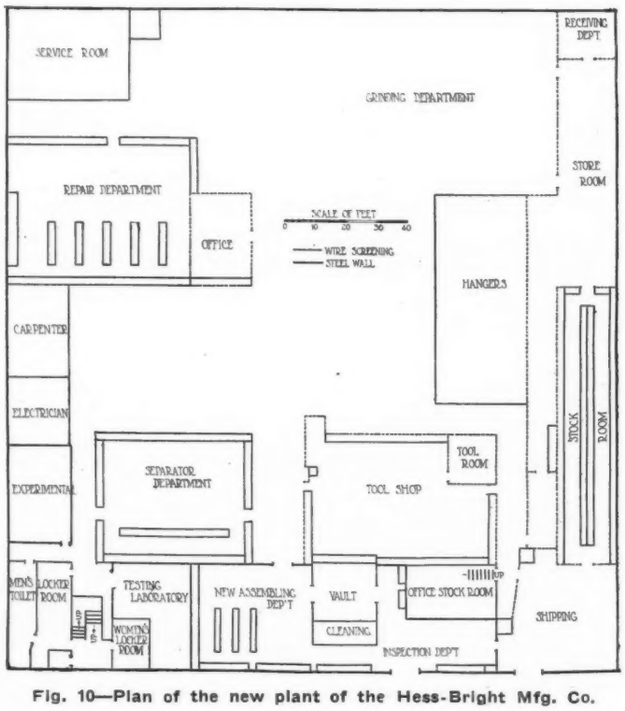


Fig. 10—Plan of the new plant of the Hess-Bright Mfg. Co.

New England To Spend $6,000,000 on Roads

Maine's $2,000,000 Bond Issue Will Go Far in Developing Automobiling in That State—Other States Active

BOSTON, MASS., April 25—New England added approximately 600 miles more of good highways to her present total at a cost of more than $6,000,000 in 1913. And as many more miles will be added in 1914 at a greater cost. As a result within a few years there will not be a road of any account in New England that will not be passable for motor cars. This does not include the thousands spent by counties and towns.

Maine has awakened to the possibilities of what good highways mean, and last year saw the installation of a highway commission of three men, the approval by the state of a $2,000,000 bond issue and work started to make the Pine Tree State a motor paradise.

Maine Repairs Worst Stretch

The state began by improving the road between the state line at New Hampshire and Portland, the worst stretch in the state, if not in New England, and which was responsible for turning many motorists out of Maine and into New Hampshire for years. Then the plans were completed for the 38-mile post road from Portland to Bath at a cost of $195,000. The commission plans to build about 800 miles of highway at a cost of about $2,500 a mile and divide the mileage between the various counties according to population.

New Hampshire Adds 106 Miles

New Hampshire added 106 miles more to its total last year at a cost of $500,000 and various stretches of its 800 miles were improved at an expenditure of $200,000 more. The three main highways running north and south connecting the mountains with Maine, New Hampshire and Massachusetts are practically completed now. So the highway commission's state engineer now has planned three highways east and west across the state that will connect with the north and south roads. This will add more than 100 miles more to the system.

Vermont Has 200 Miles of New Road

Vermont has not been behind in its highway work. In that state the plan carried out for the past 10 years is to improve each year the highways of the trunk system wherever they may be worst. This allows for a greater mileage than if macadam roads were built. The result is a system of uniformly good roads that are in condition for all kinds of traffic after they have settled in the spring. During the past year 200 miles of highways were built and improved in this manner. Many parts of the highways were also re-surfaced and otherwise taken care of and the total cost was about $700,000. This year the same policy will be carried out. The state has a total of 15,000 miles of highways.

Massachusetts Spends $1,875,000

Massachusetts is the leader not alone in building but in expending money in New England for good highways. It has always been so. Last year the state spent approximately $1,875,000 for its highways. There were 60.4 macadam and 110.9 gravel roads built, and 501.2 miles re-surfaced and improved. A number of pieces were added to the through routes. Work was begun on the Florida mountain road in the northwest part of the state to do away with one of the worst grades in the east. It provides a picturesque and easy ride to North Adams and was much needed, for it was as important in its section as the famous Jacob's Ladder road further south. This year the commission will continue its plans of piecing out the trunk lines, adding another large strip to its total that now runs close to 1,000 miles of state roads. There will be available nearly $2,000,000.

Rhode Island Has 324 Miles

Rhode Island, for a small state, did its share to connect up the links between its roads and those of Connecticut on the West. It built 30 miles of macadam at a cost of $260,000 and spent $4,269.61 on resurfacing 10 miles. The total state mileage now is 324 miles.

Connecticut Spends $2,000,000

Connecticut was lavish in its expenditures last year when about $2,000,000 was spent in piecing out its trunk lines. The state is so long rather than wide that much of the highways go in a longitudinal direction. For the coming year another sum nearly the equal of the 1913 one will be spent. The plans now call for the finishing of seven routes within the next 2 years.

The first is the shore road from the New York state line to Westerly at the Rhode Island line. A great part of it is now finished.

The second is the Connecticut Valley road from New Haven through to Springfield, Mass. This road is now in fairly good condition.

The third road is up the Housatonic and Naugatuck valleys from Stratford to Winsted.

The fourth is the one leading from New London to Thompsonville. It is nearly finished.

The fifth, and one that requires more work than all the others, leads through Mill Plain, Danbury and Hartford.

The next route passes through Norfolk to Hartford and then on to Westerly.

The seventh is another of the Connecticut valley routes straight up and down the state. When these are finished the work of trunk line construction will be practically finished.

Table of Road Activities of the New England States in 1913

State.	Built—Macadam.	Built—Gravel, Etc.	Resurfaced or Maintained.	Total Cost.
*Maine	..	..	..	..
New Hampshire	..	106	800†	$700,000.00
Vermont	..	200	4,000†	700,000.00
Massachusetts	60.4	110.9	501.2	1,875,000.00
Rhode Island	30	..	10	264,269.61
Connecticut	‡	‡	‡	2,000,000.00
	90.4	416.9		$5,839,269.61

*New highway commission inaugurated and $2,000,000 bond issue authorized too late last year to begin real work.
†Total State highways. Not all needed attention.
‡Connecticut figures not compiled yet

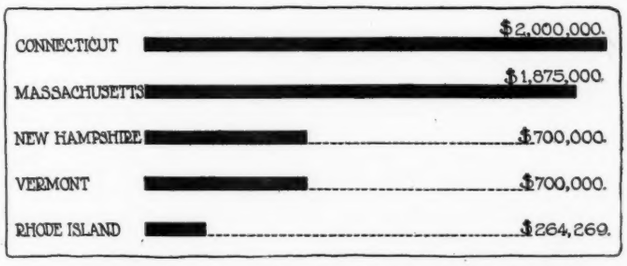


Chart showing the road work in New England in 1913

Cantilever Really an Inverted Elliptic

The Automobile Engineers' Forum

So-Called Cantilever Resembles Half-Elliptic—True Cantilever Is the Quarter-Elliptic Type — Advantages of Cantilever

NEW YORK CITY—Editor THE AUTOMOBILE:—It has seemed strange to me that some one before now has not drawn attention to the fact that the so-called cantilever spring is correctly speaking not a cantilever but an inverted half-elliptic. This is important, not for the sake of correct terminology because quibbling over such matters is a waste of time, but because the use of the word prevents the average man from seeing the similarity and difference between this type of spring and the half-elliptic. He accepts the cantilever as a new type and thinks that since this is so its action must be different and possibly superior to the common elliptic type while as a matter of fact the advantages of the cantilever are due to differences in mounting entirely.

Before going further it would be well to define the term cantilever spring, or beam in its broadest sense, since a spring from the engineer's viewpoint is merely a very flexible beam. A cantilever beam is one that is rigidly supported at one end and free everywhere else. According to this definition a quarter-elliptic spring is a true cantilever but the so-called cantilever is not, as it is supported at one end and the middle. In fact even that portion of the spring that overhangs the axle cannot even be considered a cantilever because it is pivoted to the frame and not rigidly fixed. The three spring types under discussion are shown in Fig. 1.

Similarity of Two Types

Now let us consider the resemblance between the so-called cantilever and the ordinary half-elliptic. The latter may be considered as a simple beam, Fig. 2, loaded by the weight of the car at its two ends, the reaction to this load occurring at the center where the spring is supported by the axle. For simplicity we will assume that the spring is attached to the axle at the center and not offset.

With the so-called cantilever, the half-elliptic is merely turned upside down and instead of attaching the center to the axle it is attached to the frame, while one end is attached to the axle.

What is gained by this construction? Instead of submitting the frame to a straight upward thrust when a bump is encountered, the spring gives the frame a torsional movement and much of the force of the blow is lost in the vibrations of the spring and frame, before the shock is transmitted to the body. The result is a blow greatly reduced in force.

Cantilever Easier Riding

The upward thrust of the half-elliptic on the body when the wheel passes over a bump is shown in Fig. 2, while the direction of the forces when the so-called cantilever is similarly acted upon are shown in Fig. 3, the axle tending to move directly upward but since the spring is pivoted to the frame at its center, this produces a reaction at A that tends to rotate the spring about the pivot point B. Therefore the first tendency is for the body and chassis to rotate in the direction of the arrow about the point B. When the inertia of the body and chassis has been overcome the force of the blow will cause the body to rise, but meanwhile, as previously stated, a great deal of the force will have been spent in twisting the frame as described.

There is also one other point in favor of the so-called cantilever spring. It may be made any length without altering the position of the rear axle with respect to the chassis frame. With the half- or full-elliptic, if the spring is made very long the axle will be drawn too far under the body for easy riding.

There is one disadvantage of the cantilever spring that I have never seen mentioned, although it must be obvious enough to engineers, and that is that it must be twice as strong as the ordinary spring in order to withstand the same load, that is, its moment of inertia must be double.

This can be easily shown. Consider first the ordinary half-elliptic. Assume that the weight on one wheel is 1,000 pounds, then there is a load of 500 pounds to be carried by each end of the spring and the upward reaction on the center of the spring will be the sum of these two, that is, 1,000 pounds, which is the weight on the axle.

But with the cantilever, the upward thrust of the axle against the spring end is 1,000 pounds. This is balanced by a load of 1,000 pounds at A and therefore the load at B is the sum of these two or 2,000 pounds.

The actual loading is identical, except that the forces acting on the so-called cantilever are twice as great. This is shown by diagram in Fig. 4. It will be noted that in both cases, the end loads are equal to each other and that their sum is equal to the center load.—CARL S. TAYLOR.

Five Reasons in Favor of Detachable Cylinder Heads

DETROIT, MICH.—Editor THE AUTOMOBILE:—One of the reasons for using the detachable cylinder head in block cylinders is that it enables one to accurately machine all the cylinders simultaneously.

Casting the cylinder head separately enables one to accurately cast the compression space in the cylinder head in the green sand, which is practically impossible when you have to resort to the use of cores.

Then again it is possible to machine the compression space accurately; the accuracy of the compression space on all the cylinders is very essential in order to have a smooth-running motor with minimum vibration.

Another reason is because it enables one to make a shorter engine of the L-head type, and also enables one to use valves 1-8-inch larger in diameter than we could in integral cast heads of the L type construction.

Carbon Readily Removed

The ease with which the cylinder head can be removed enables one to readily remove the carbon collected on the cylinder head and in the walls of the compression space, and also to readily regrind the valves, which is not possible when the valves are set down in a pocket, as is the case in integral cast heads. It is very difficult in integral cast heads to accurately cast the depth of the compression space, and in machining these cylinders we machine from the bottom of the compression space. Also, we must make greater allowances for vibration in machinery than we would in the separate head, in order to reduce the scrap pile.

When the separate head is properly constructed, sub-

stantially ribbed, and bolts put in in the proper place, there is absolutely no danger whatever in regard to leakage between the cylinder head and the cylinder by the gasket.

After manufacturing many thousands of motors of this construction we are more than ever convinced, from our past experience, that this is the proper way to build motors. —JOHN O. HEINZE, Northway Motor & Mfg. Co.

Better Brakes Are Possible—Why Not Make Them?

PHILADELPHIA, PA.—Editor THE AUTOMOBILE:—For years I have been a close student of automobile engineering in all its branches and there are several points which most of our engineers seem to be neglecting, though they are important and as yet by no means perfected.

The particular feature which I have in mind is brake development. We all know that brakes are essential to the economical and safe operation of the car and yet comparatively little has been done to improve them or to render them more efficient than they were back in 1906 or 1907. Why is this? Do our engineers think that there can be no possibility of progress in the design of this part of the car? Many will say that they have done much to simplify and to render accessible the adjusting means, that they have increased the size, cut down the weight of the bands by using better metal, improved the quality of the lining, etc. This may be true, but what I wish to bring out is the fact that, while new motors, new gearsets, etc., have been coming out in large numbers, I have read of but a single instance where anything new in the line of brakes has been brought out in the last few years. The instance I mention was an electric brake described in THE AUTOMOBILE for January 1, which was designed to operate both sets of brakes.

Why have not other inventors given this subject their attention? It would seem that there is ample room for improvement in this particular and the results to be derived from a really efficient, sensible, marketable device would be not only productive of great remuneration to the inventor, but also of much satisfaction to the car owner and user, to say nothing of the numerous accidents which would be avoided.—JOHN H. BELDEN, M. E.

—

Cooling Water Out of Control

NEW YORK CITY—Editor THE AUTOMOBILE:—In the past few months I have several times run across statements which showed that their authors unanimously believed in the merits of bringing the temperature of the water under control. The mere fact that many successful accessories which are designed to give the driver knowledge of the temperature of the water are in daily use would signify that some better use may be made of this knowledge.

Why should the quantity of water delivered to the water jacket not be controlled? It stands to reason that on a day when the temperature is 90 degrees, conditions should be different than when it is 25. Is it good engineering to cover the radiator with newspaper?—M. F. BRONSVELD, M. E.

—

Makers Should Equip Cars with Heavier Tires

ALTON, N. H.—Editor THE AUTOMOBILE:—I have read the discussion on the tire question with a great deal of interest and would like to express a few ideas. I think large tires are best for many reasons. They can be used with less air pressure, which would make riding a greater pleasure and also save wear and breakage in the vital parts of a car caused by the continual jar and vibration when riding over rough roads.

Oversize Tires Are Best and Cheapest

A tire pumped hard is really a hard tire, for there is very little difference in a solid tire and one blown up with all the air pressure it is capable of holding unless the tires are overloaded. Then they soon blow out and go to pieces; but the oversize tire, which, of course, is much stronger, will carry its load a great deal better, giving less trouble, a longer life to the car and more bearing surface on the tread.

Tires are going to cost less in the near future and car makers should use and equip the cars they sell with 4-inch tires where they now use 3 1-2-inch, 4 1-2-inch where they now use 4-inch and so on; 1-2-inch larger size tires on most all cars would add to the price a very little, but the longer life of the tires and car would increase the number of buyers because of more satisfactory service.

Most Cars Too Heavy for Their Tires

There would be fewer repairs on broken springs and other parts, less fault found with all makes of cars. Most cars are too heavy for their tires so that the tires have to be pumped hard to stand up; let us use larger tires with two-thirds the air pressure now used.—H. P. TIBBETTS.

—

Denver M. C. Has Road Commissioner

DENVER, COLO., April 15—The Denver Motor Club has appointed a road commissioner to travel over the state and promote highway improvement in every section. The commissioner, who begins his new duties today, is W. S. Dawson, of Denver, already well known throughout the state in good roads and motoring circles. He will lecture on road betterment, demonstrate an inexpensive and effectual method of dragging dirt roads, log and map the most important routes for tourists, extend the marking of roads with signboards and co-operate with county commissioners, motor clubs and all other organizations interested in good roads.

The road commissioner will be equipped with a big, powerful car, and will carry with him a model road drag of light and compact construction for use in demonstrating the system of keeping dirt roads in good condition with a split-log drag.

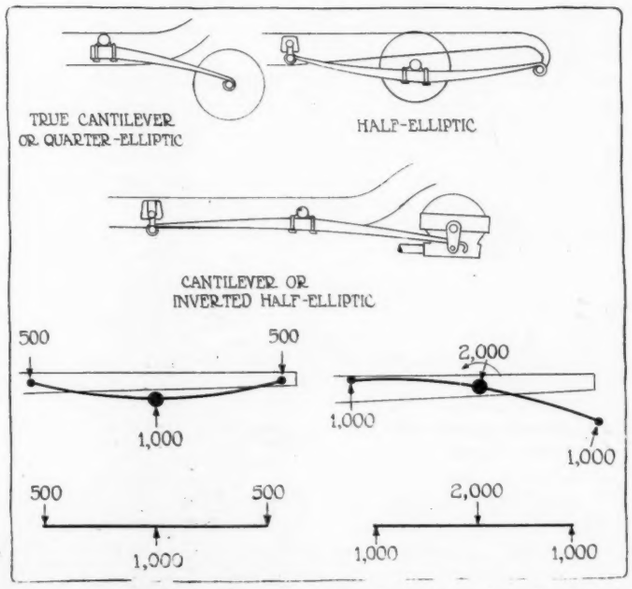


Fig. 1—Top three diagrams—The three types of springs illustrated.
Fig. 2—Left, center—Diagram of forces acting on a half-elliptic.
Fig. 3—Right, center—Similar diagram of so-called cantilever.
Fig. 4—Bottom pair—Force diagrams of these two springs, showing them when considered merely as beams

Compression Pressure—Its Measurement

Conditions Within the Cylinder at All Parts of the Cycle Determined by the Use of the Okill Pressure Indicator

By John Okill, Inventor of the Okill Indicator

Part I

IN an article which appeared in THE AUTOMOBILE for May 29, 1913, Professor W. C. Marshall of Yale University explained the principle and method of operating the Okill pressure indicator, illustrated various methods of connecting the indicator to engine cylinders, and gave some interesting results of tests that he had made on automobile engines under different running conditions. Owing to the interest the article created, THE AUTOMOBILE has asked the author to furnish additional information obtained with the aid of the instrument in question.

There is no need to draw attention to the value of the steam-engine type of diagram indicator when making tests of steam or gas engines, or even to its value for locating running faults in the ordinary course of working.

Diagram indicators are universally used on moderate speed engines because the difficulties in connection with their application are practically non-existent. When, however, we come to the application of the diagram indicator to internal-combustion engines having crankshaft speeds above 300 revolutions per minute, the application becomes increasingly difficult. Diagram indicators for high-speed engines are necessarily of more delicate construction than slow-speed indicators, and more care has to be exercised in their manipulation if accurate deductions are to be made from the resulting diagrams.

In general, high-speed, internal-combustion engine sets compared with steam engines have more cylinders to develop the same horsepower. This is especially so in the case of marine and road vehicle engines, and thus the fitting of indicators becomes more difficult and more necessary. Apart from the mere multiplication of indicators and operating gear and the difficulty of arranging linkwork connections through inclosed crankcases, the high-speed diagram indicator has yet to be designed that calls for merely ordinary skill in its manipulation. In addition to the foregoing, the cost of such instruments has to be considered if they are to be of universal application. As high-speed diagram indicators stand at present, their cost is prohibitive for ordinary commercial use, although their value for test purposes in the hands of skilled operators is admitted.

When one considers the complex action that takes place in the cylinders of a high-speed gasoline engine, it is apparent that at least some indication of pressure conditions and gas distribution in the cylinders is needed in order to see that each piston is transmitting an equal force to its crankpin.

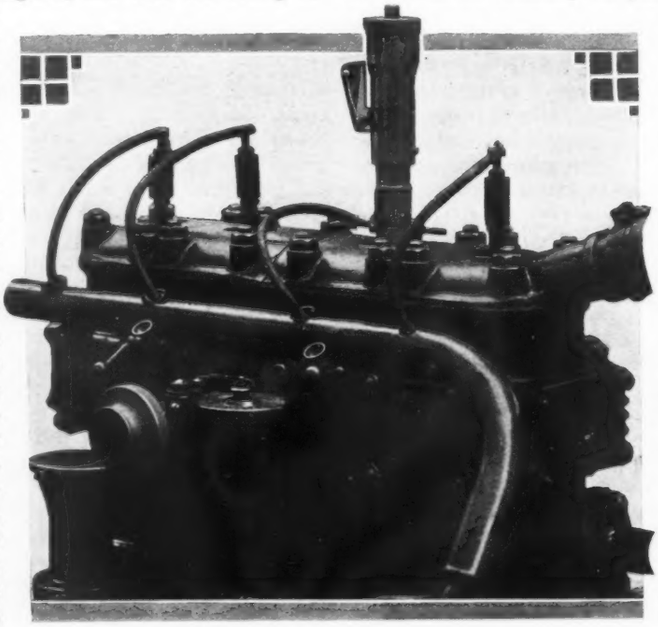


Fig. 1—Okill indicator mounted on four-cylinder gasoline engine

Compression and Explosion Pressures

With the object of obtaining information about compression and ignition pressures, the author designed the instrument, the action of which was explained in the previous article. References to the action of the instrument will be made in this article, and these, together with the illustrations Figs. 1 and 2, render further detailed explanation unnecessary.

At the outset it may be well to point out that the author's indicator does not enable the indicated horsepower of an engine to be determined, but it does give, accurately and at the highest engine speeds, instantaneous measurements of compression and ignition pressures in any internal-combustion engine. The possession of this information eliminates a lot of uncertainty regarding the reasons for loss of power in an engine, because it locates shirking cylinders and enables new engines to be tuned up to a high state of efficiency before leaving the test bench.

The features of the instrument are that its parts are at rest at the instant of taking a pressure reading, it gives accurate readings at any engine speed, it may be attached to any plug hole communicating with the combustion chamber, and this is the only connection required, and it is provided with a device whereby its piston is lubricated without dismantling the instrument. It cannot be damaged in use.

Some time ago the author used this indicator, more as a test of the indicator than the engine, to determine the best strength of spring for the automatic inlet valve of a 75 by 80 millimeter gasoline engine. The results obtained, and here tabulated, are interesting as showing the detection of small differences in compression pressure due to the influence of the spring strength on the opening and closing of the valve.

Fuel Economy Fundamental

All internal-combustion engines of whatever type, owe their successful existence to what may be termed the fundamental principle of fuel economy, that is ignition of the charge of gas when it is

compressed to a pressure considerably above that of the atmosphere. In this connection one has but to compare the gas consumption of the Lenoir non-compression engine, which was 100 cubic feet of illuminating gas per indicated horsepower hour, with a modern gas engine of small size having a gas consumption of about 20 cubic feet per indicated horsepower hour.

It is in the measurement of compression pressures that the author's instrument finds its most extensive application, and it is interesting here to consider the function of compression and to what limit it may be advantageously carried in a gasoline engine.

Assuming a charge of gasoline vapor and air to be compressed above the piston, and that a spark starts at the plug points:

If sufficient oxygen is present in the mixture surrounding the plug points, ignition will take place, but the rapidity with which inflammation of the whole mass of gas will take place depends on the proximity of other molecules necessary for combustion, and on the turbulence of the mixture. The molecules of a mass of gas are continually moving about at high velocities, the velocity with which they move increasing with the temperature. Thus in an engine cylinder, the velocity or turbulence of the molecules amongst themselves will depend on the pressure, and resulting temperature, at the end of compression. Compression, then, increases the rapidity of ignition by increasing the turbulence of the molecules of gas contained in the clearance space, and by bringing them into more intimate contact due to the increased density of the gas at the end of compression.

Assuming the mixture quality and compression pressure to be such that, in an engine running at 1,800 revolutions per minute, the charge is completely ignited while the crank moves through an angle of 30 degrees the time is 1-360 of a second. For a crank sweep of 15 degrees the time will be 1-720 of a second, while in a high-speed, high-compression engine ignited by magneto the time for complete ignition is certainly less than this judging by the maximum pressure developed in the cylinder.

For maximum fuel efficiency it is necessary to bring the molecules into intimate contact, so that ignition will be carried to every part of the combustion chamber in the small interval of time available, and also take place in the same interval of time in each cylinder of a multi-cylinder engine. In practice, thermal efficiencies do not rise with compression to the extent indicated by theory, owing to heat loss through the cylinder walls. This loss becomes greater with increases of pressure and temperature and a point is soon reached when any advantage that would appear to accrue from increased compression is more than counterbalanced by excessive heat loss through the cylinder walls. In gasoline engine practice, judging from experiments that have been made with compression pressures in excess of 90 to 100 pounds per square inch, this economical limit of compression pressure has apparently been reached. Were this not the case, there are other reasons why higher compression pressures cannot be used and these will be referred to.

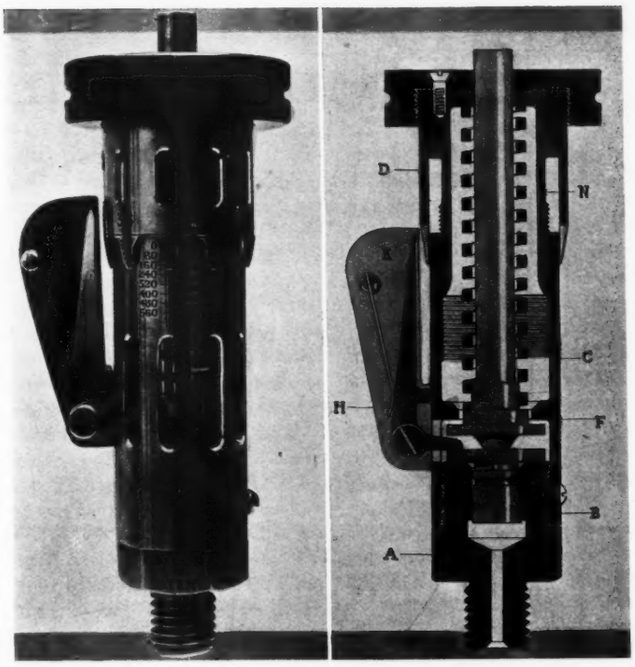


Fig. 2—Left—Exterior view of the Okill indicator, showing pressure. Fig. 3—Right—Screw N is rotated till spring pressure on piston B just balances gas pressure underneath piston. H is a tell-tale finger vibrating till spring pressure equals gas pressure

Thermal Efficiencies Low

As a consequence, the thermal efficiency of even the best type of gasoline engine operating on the Otto cycle, is comparatively low. The maximum value for compression pressures in ordinary motor vehicle engines is about 80 pounds per square inch gauge, but the majority of engines tested by the author have not exceeded 70 pounds per square inch, many being lower than this.

As a result of pressures in excess of 100 pounds per square inch, the temperature attained during compression is generally sufficiently high to cause pre-ignition of the charge, and even in a moderately high compression engine, pre-ignition may occur if the cylinders are allowed to overheat. High-compression engines are more liable to overheat and will not run so slowly on full throttle, as low compression engines, except when fitted with suitable flywheels.

Further, in an engine that runs with its jacket water touching the boiling point, pre-ignition may occur due to deposits of burnt lubricating oil remaining more or less incandescent during the suction and compression strokes; such engines consequently require frequent cleaning internally, and care in the selection of a lubricant.

It is not recommended that car owners should deliberately increase their engine compression pressure by attaching a plate to the piston, substituting a longer connecting rod, or in any way reducing the compression space, except of course in the case of an old engine with a compression pressure of 30 or 40 pounds per square inch.

Modern gasoline engines are designed to give the best all-around results, the object of the compression indicator, from the car owner's point of view, being to enable the compression pressure to be kept up to standard by attention to the tightness of valves, valve caps and piston rings and to keep the same pressure in individual cylinders. The application to a motor car engine is shown in Fig. 3. In connection with this question of compression pressure and fuel efficiency, some valuable information is given by Professor Callendar (Proc. Inst. A. E. Vol. III p. 457—) when discussing a series of experiments carried out by Professor W. Watson. In these experiments the compression pressure was varied by packing pieces between the cylinder base and its seat on the crankcase. The results showed that by reducing the compression ratio from 4.71 to 3.92 the efficiency was not reduced.

Expansion vs. Jacket Losses

The explanation of the apparent anomaly as given by Professor Callendar is "that in varying the compression ratio, the ratio of surface to volume in the combustion chamber is simultaneously varied to an extent which, in this particular instance, almost exactly serves to mask the effect

(*Continued on page* 919)

Care vs. Speed in Washing Cars

Unskilful Methods or Rushing the Work at a Pace Beyond Which Care May Be Exercised May Prove Disastrous to the Polished Finish—The Correct Way to Wash a Car

By M. C. Hillick

THE car carelessly or improperly washed and cleaned becomes shabby and worn before its time. It not infrequently happens that a dollar's worth of work withheld at a time when the car is in need of washing will result in the ruination of the varnish, and a consequent outlay of $40 or $50 to restore the finish to its original condition. Improper washing of the car, caused by unskillful methods, or to rushing the work at a pace beyond which due care and attention may be exercised, will likewise prove disastrous to the finish.

Recently the writer overheard a conversation between two car owners, during which the car washing question was discussed. It was claimed by one of these men that a good garage employee could wash and polish twelve cars, taking them as they run, per night of ten hours work. Without any attempt to here wrestle with the efficiency problem we desire to record the conviction that no one can take twelve average cars, as they come in from the road, and wash them, not to mention polishing them, in the above noted time, in a manner to improve the appearance, and promote the durability of the finish.

Almost without exception the car upon being returned to the garage at night, after service upon the road, should receive a careful washing.

Muddy roads are invariably active and destructive enemies of varnish. The mud in some sections of the country, notably sections where the soil is charged with a considerable percentage of lime, is particularly deleterious to the varnish.

Mud Generally Alkaline

Roads given over largely, or to any considerable extent, to horse travel, and therefore more or less charged with ammonia, are likewise harmful to the finish. This is true whether these latter highway accumulations are picked up in the form of dry dust or of mud splotches. In all cases, and under all circumstances, moist earth, identified under the term of mud, or dust moistened with water, partakes strongly of an alkaline nature. It possesses an extraordinary capacity for suction or capillary attraction, and its action upon the finish of the car, if left to dry upon that finish, serves, either to extract the oil from the varnish, or to cause actual saponification, not only of the oil but of the gum constituent of the varnish.

This form of varnish spotting, or loss of lustre, is more destructive than any other known agency.

Prevention by means of washing and cleaning methods are comparatively cheap.

Soapy or dirty water, the former, when containing a strong solution of alkali, will cause spotting, and if such water is allowed to remain upon the surface for any considerable length of time the potash and acid nature of the water will bite sharply into the varnish, rendering it very difficult, if, indeed, not impossible to remove the resulting effects, except by rubbing the surface with water and pumice stone flour, and then revarnishing.

As a rule, a prompt washing off with clean soft water following the development of these water spots will restore the finish to its original condition.

Spotting is also due, not infrequently, to coal gas. This trouble is marked during rainy laden seasons of the year. It takes on the form of a dull, lustreless, greasy film. The only cure for this trouble consists in rubbing the surface down, as above advised, and revarnishing.

Strong currents of air, impregnated with poisonous fumes, will also create spotting of the newly varnished car. This class of spotting yields a crop of dull, surface spots. If neglected until the varnish becomes inoculated with the disease, the only cure, as a rule, is to rub down and revarnish.

Can Be Cured Temporarily

As a temporary expedient, these various types of spotting may sometimes be rendered indistinguishable by rubbing with a soft cloth moistened with equal parts of pure raw linseed oil, gum turpentine, and denatured alcohol, and, then at once polishing with a clean piece of blotting paper.

Loss of lustre in the finish without the apparent spotting of the varnish, ensues, perhaps gradually, but none the less certainly, by reason of neglecting the washing. As a matter of fact, a large proportion of the defects which appear to prematurely afflict the finish, originate from neglect of washing. Good and suitable tools for washing are indispensable. These should consist of two fleece wool sponges of a size convenient to handle, one for the body, and one for the chassis. Also, at least two chamois skins or wash leathers, as they are called, four galvanized iron pails, and a couple of soft point water brushes for tooling about bolt heads and surface ornaments. Then there should be a good brush for the upholstering, and a whisk broom or two for mats, rugs, top-linings. mohair tops, etc.

Brush Upholstery First

Before washing the car, all upholstering, linings, rugs, tops, and car interior furnishings of every description should be carefully brushed and cleaned. A vacuum cleaner, operated at a pressure suited to the delicacy of the fabrics, is suggested. Such a process eliminates the dust and dirt particles, set in motion by the brush and broom methods. All glass about the car should be cleaned by first wetting them over with a soft piece of sponge moistened with denatured alcohol, diluted to one-third its original strength with water, and dipped lightly in pumice stone flour. Allow this mixture to dry on the glass, then wipe off with a dry cloth, and bring to a polish with tissue paper.

Rubber and leather tops, in the event of their being spattered with mud or otherwise dirty beyond the possibility of cleaning off nicely with a soft feather duster, should be washed with clean tepid water, into which a slight percentage of castile soap has been stirred. Apply to the leather or rubber with a soft wool sponge. Then rinse off with the water, and dry up with the wash leather. This brushing and renovating of the car interior furnishings,

cleaning of the top, etc., is an important part of the regular cleaning processes to which the car is entitled.

In washing the body of the car the practice of using a hose has, in many establishments, been discontinued. When, however, the hose is employed it should merely supplement the sponge process, and should always be used at the minimum pressure. No one thing will do more to damage the varnish, both in appearance and in quality for service than a hose operated under high pressure.

The set of washing utensils used upon the chassis, the wheels, the running board, mud guards, should never be used upon the body of the car. The washing should not be done in the bright sunlight, under which evaporation occurs too rapidly. Water drying too rapidly upon the surface often streaks and spots the varnish especially in the case of a recently applied varnish. During the summer months moderately cold water applied to the finish will, up to a certain point of wear, serve to clear up and intensify the brilliancy of the varnish. This is notably true in the treatment of a newly applied varnish.

Protect Interior Finishings

In washing limousines, touring landaulets, broughams, berlines, and similar types of cars, care should be exercised to protect all interior furnishings of the car, window casings, and all points, in fact, likely to be injured by moisture.

Commence the operation of washing the car body by placing the sponge, loaded to its capacity with water, at the top of the panel, and by pressure allow the water to flood over the surface. Continue this flooding process until the surface accumulations are softened up, and by force of the water flow carried down and off the surface. In the case of a badly mud-smeared car it will take some time under this process of washing to loosen up and carry off the main quantity of dirt. After this is done, thoroughly wash out the sponge and pails, and begin all over again with a clean supply of water. In the event of using a hose in this process of sponging, the work can be facilitated somewhat, but the water pressure should always be light, and under the direct personal control of a competent, trustworthy workman.

Use Plenty of Water and a Sponge

Use plenty of water, and proceed to float the mud and dirt off the surface, rather than attempt to wipe it off. The latter operation is likely to cause the minute particles of grit, present in all earthy substances, to scratch and disfigure the varnish. After a third rinsing off with clean water squeeze the sponge out as dry as possible, and wipe off surplus water, after which with a clean, dry chamois skin, proceed to wipe the surface gently.

Do not rub the surface with the skin or leather nor attempt to catch up the mist which clings to the finish. A few minutes of air drying will dissipate this moisture and the varnish will hold forth with increased lustre.

Care and skill are likewise essential in washing the chassis, and other parts of the car not included in the body surface. Washing operations, as above described, are, in the main, applicable to the chassis.

Compression Pressure—Its Measurement

(*Continued from page* 917.)

of increase of compression." In the case of the 4.71 compression ratio, the ratio $\frac{\text{surface}}{\text{volume}}$ of combustion chamber was 2.01, while in the 3.92 compression ratio the ratio $\frac{\text{surface}}{\text{volume}}$ was 1.69. Thus in the high-compression ratio of 4.71, the additional heat loss to the walls, negatives the gain resulting from increased compression. It would thus seem evident that to obtain maximum fuel efficiency, the ratio of surface to volume should be as low as possible. This is a feature claimed for sleeve-valve engines which have combustion chambers approximating to the spherical shape. It is a debatable point as to whether this relation of surface to volume is as important as theory seeks to prove. There are many high-compression engines having a high surface volume ratio and a high fuel efficiency, quite as high in this latter as other engines with a minimum surface volume ratio and the same compression pressure. Possibly the fuel efficiency of the former could be increased if their surface volume ratio was reduced, but this might involve sacrificing other features of design which enables them to stand superior to this feature of surface volume ratio. High-speed engines certainly benefit by having a high compression, ignition takes place so much quicker, weaker mixtures can be fired, and the time during which heat loss can take place is correspondingly less than in slow speed engines.

Apart from the low fuel consumption common to an efficient engine, there are other advantages. Obviously combustion in an engine that develops its power on a low fuel consumption will be practically complete. This being so, a clean combustion chamber, valves, piston and spark plug should result, and with the increasing use of cheaper fuels these are features of importance. Uneconomical engines will generally be found to be dirty and noisy, while, owing to incomplete combustion, flame issues at the exhaust valves. The result is that exhaust valves require more frequent grinding and reseating than should be the case.

(*To be continued.*)

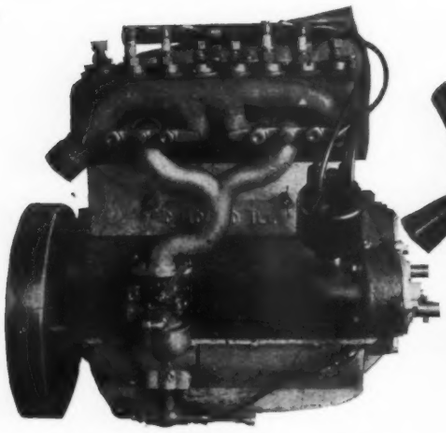
Speed in revs. per min.	Closing force of spring in pounds							
	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
	Compression pressure, lbs. per square inch							
370	61	60	58	54	52	49	47	44
670	58	65	65	62	57	54	53	49
960	..	61	63	63	62	58	52	49
1270	..	65	62	63	63	60	58	52

The spring actually fitted gave the following results:

R.P.M.	370	670	960	1270
Compression pressure, lb. per square inch.....	60	64	64	61

Horses Decreasing in Cities

Sixteen out of thirty-one principal American cities show a decrease of the number of licensed horse-drawn vehicles in relation to population. In seven cities there was an actual decrease in 1912, as shown by statistics collected by an organization of horse interests for the years 1911 and 1912. Official figures for the last year were not available at the time. These seven cities and their respective percentages of decrease are: Indianapolis, 14.5; Columbus, O., 5.9; San Francisco, 4.8; St. Louis, 2.4; Omaha, 2.1; New York, .8 and Chicago .5. The rate of increase in licensed horse-drawn vehicles has not kept pace with the growth of population, in nine other cities where there was an average increase of 2 per cent. in horse vehicles and an average increase in population of 7.8 per cent. a year.



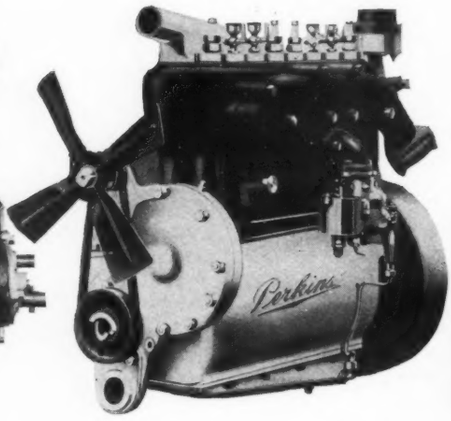


Fig. 1—New Savage—Made in Chicago. Fig. 2—Perkins motor manufactured by Massinick-Phipps. Fig. 3—Motor Products Co.'s Motor

Many New Cyclecar Motors Announced

Both Four-cylinder and V-types Offered — Many Accessories Brought Out, Including Self-Starter and Electric Lighting Outfits

WITH the rapid expansion of the cyclecar industry has come a demand for all sorts of cyclecar parts and motors in particular. To meet this demand of the cyclecar manufacturers, parts makers have sprung up with almost equal rapidity. Many new motors have been announced recently, as well as other parts.

Development in the motor field is still about equally divided between the four and the V-twin, the latter always being air-cooled in this country and the former water-cooled with two or three exceptions. There is no indication, at the present time, which type will become the more popular.

Badger—A Four-Cylinder Motor

The Badger Mfg. Co., maker of metal specialties at Oshkosh, Wis., has just placed on the market a four-cylinder, water-cooled motor, Fig. 5, with a piston displacement of 68.2 inches, or nearly 2 inches below the limit. The motor develops 7 horsepower at 1,200 revolutions per minute and is capable of 3,000, it is claimed, by virtue of the large valves and passages.

The cylinders are cast in a block and all manifolds are integral and the valves are inclosed. An L-shaped combustion chamber is employed and access to the valves and pistons is obtained by removing the cylinder head. Lubrication is by splash, the connecting rods dipping into troughs. The circulation of oil is maintained by a pump. Ignition is by magneto. A mechanical starter is fitted.

Ives V-Motor High Powered

A comparatively high-powered, V-type, air-cooled motor, Fig. 7, is produced by the Ives Motorcycle Corp., Owego, N. Y. It is rated at 15 horsepower, and is capable of a speed of 3,000 revolutions per minute, it is stated. According to definition a car equipped with this motor must be classed as a light car rather than a cyclecar, as the motor has a piston displacement of 77.3 cubic inches. The maker claims, however, that a motor of this size is required to provide adequate power for a cyclecar which, while it may have a catalogue weight of 600 pounds, will actually tip the scales at 1,000 pounds when loaded, with passengers, fuel and equipment.

The Ives motor has its cylinders set at 45 degrees and the bore and stroke is 3.5 by 4 inches. Intake, as well as exhaust valves, are mechanically operated, the former being located over the latter and operated by a rocker mechanism. Large valves are used, the intake being 1.875 and the exhaust 2 inches. The flywheels are 10.5 inches in diameter and weigh 38 pounds.

Main and crankpin bearings are 1 inch in diameter and are equipped with roller bearings. The piston pin diameter is .985 inch. Oiling is by pump. The motor weighs 110 pounds.

Thorne—A Four-Cylinder Air-Cooled Design

A four-cylinder air-cooled motor, Fig. 6, with overhead camshaft and valves in the head is about to be placed on the market by the Thorne Motor Co., Detroit, Mich. It is the design of W. H. Thorne, formerly purchasing agent for the Henderson Motorcycle Co.

The bore and stroke is 2.625 by 3.25 inches, giving a piston displacement of 70.35 cubic inches, which puts the motor in the light car class by a fraction of an inch. The weight is low, being 106 pounds. This has been obtained by the use of air cooling and the liberal use of aluminum.

Three S. K. F. self-aligning ball bearings carry the crankshaft, while the camshaft and vertical driving shaft are also carried on S. K. F. ball bearings.

By placing the camshaft directly over the valves, long rods and rocker arms are eliminated and the inertia of the valve parts is reduced to a minimum. The cams are integral and the camshaft runs in oil.

The big ends of the connecting rods are fitted with roller bearings.

Ignition is by coil and lubrication is maintained by a force-feed system, oil being forced to the cams, gears and cylinders by a flywheel pump.

Motor Products Co. Announces V-Motor

A V-type, air-cooled motor, Fig. 3, that comes within the cyclecar definition, since it has a piston displacement of 59.6 cubic inches, has been announced by the Motor Products Co., Detroit, Mich. It is rated at 9-11 horsepower.

Nothing radical is to be found in the construction, standard practice having been followed throughout. The cylinders are L-head castings finished in black. The carbureter, a Schebler make, is carried high between the two cylinders and the magneto or Unisparker, is situated at the rear. The exhaust pipes sweep to the rear with broad curves. Large size valves are employed. Both are mechanically operated and interchangeable. A feature is the inclosure of the valve stems and push-rods by removable steel tubes.

The cams are integral with the shafts and one cam suffices to operate both inlet valves, and another both exhaust valves. Phosphor bronze bearings are used throughout and all shafts are hardened and ground.

An aluminum crankcase is employed, the flywheels are extra heavy and perfectly balanced, it is stated. The weight complete is 90 pounds.

Optional equipment includes external flywheel, starting crank, belt-driven fan, control wire fittings, muffler, exhaust pipes and compression release.

Massnick-Phipps Four-Cylinder

The Massnick-Phipps Co., Detroit, is building a small motor for light cyclecars, as shown in Fig. 2.

The motor 3 3-4 by 4 inches is rated at 15 horsepower and its weight with all equipment but radiator and water is 195 pounds.

Several motors of somewhat similar size and design have been announced, one by the Hermann Engineering Co. and another by the Farmer Mfg. Co. As yet these motors are beyond the cyclecar definition of size, all being above 71 inches.

One of the most interesting of the new motors is the C. S. C., Fig. 4, designed by C. S. Cameron, known for his former work with air-cooling on big car motors. This motor is a four-cylinder design with horizontal, overhead valves as manufactured by the Cameron company for years and is like the old Frayer-Miller or the more recent Dusenberg. The bore is 3 inches and the stroke 3 1-2 so that the motor is in the light car motor class.

Gadabout Has Unit Plant

The Gadabout cyclecar is fitted with a new motor, a four-cylinder L-head block type, 2 1-2 by 3 1-2 inches, with detachable head, this coming within the cyclecar class, having about 68 cubic inches displacement. This motor is a unit with the gearset. Annular ball bearings are used throughout motor and gearset. The clutch is a cone and the gearset a sliding, selective type. The shifting lever is mounted at the rear of the gearset.

Another cyclecar motor with four cylinders is made by the Ceco Cyclecar Co., Chicago, but details of this in the water-cooled model are not yet available. The air-cooled type is very attractive and reminiscent of the Henderson motorcycle motor with changes to fit the new loads.

Chicago has another small motor for the small car class in the Savage, a 3 by 4-inch water-cooled, four-cylinder design. This motor is not yet ready for quantity production but work is going on rapidly. It is shown in Fig. 1.

The Mack Motor Co., Milwaukee, Wis., making V-type motors of 9 horsepower, is working its plant night and day to keep up with the demand for real cyclecars. The motor has been greatly increased in power by a new timing and valve arrangement, and a large inspection department now guarantees to the product the most accurate workmanship possible. The firm is shipping about twenty motors a day.

The Spacke Machine Works, Indianapolis, is also working to its capacity on V-type cyclecar motors and is shipping them in large quantities. One of the largest users is the Scripps-Booth Co., of Detroit, this firm having several hundred in stock on the floor as a reserve at all times.

Cyclecar hubs for wire wheels are made by the Harris & Reed Mfg. Co., 1510 West Fifteenth street, Chicago, Ill. The feature of these hubs is the use of annular ball bearings. It is claimed that this is a new departure, in this line of work. The hubs are made in different sizes and are furnished with sprockets and brake bands, if desired.

Eureka Lighting Generator

Realizing the demand for electric lights on cyclecars, the Hendricks Novelty Co., Indianapolis, Ind., has brought out a magneto type generator, Fig. 8, designed for cyclecars, that is light, and low in price. It is known as the Eureka BC2, weighs 14 pounds and lists at $30, when equipped with automatic cutout and governor. It measures 8.5 by 4 by 6 inches. When a storage battery is not used, the cutout may be omitted and the price of the machine is then only $20.

The generator is capable of furnishing 30 to 35 candlepower and will charge a battery at the rate of 5.5 amperes.

The automatic cutout is operated by a centrifugal governor which also controls the maximum speed, preventing the armature from being driven at too high a rate.

Benedict Metal Castings for Parts

James Graham & Co., New Haven, Conn., for many years manufacturers of brass parts for the motor car industry, have instituted a special cyclecar department. Special stress is laid on the castings made from Benedict metal. This alloy is particularly interesting because it embodies the qualities of

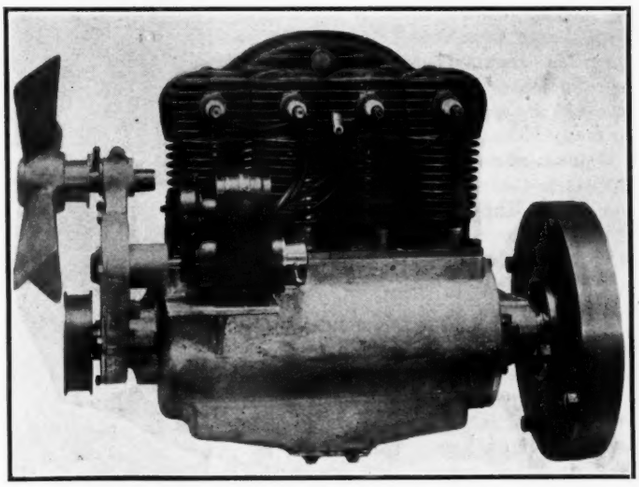


Fig. 4—C-S-C air-cooled motor, with horizontal valves

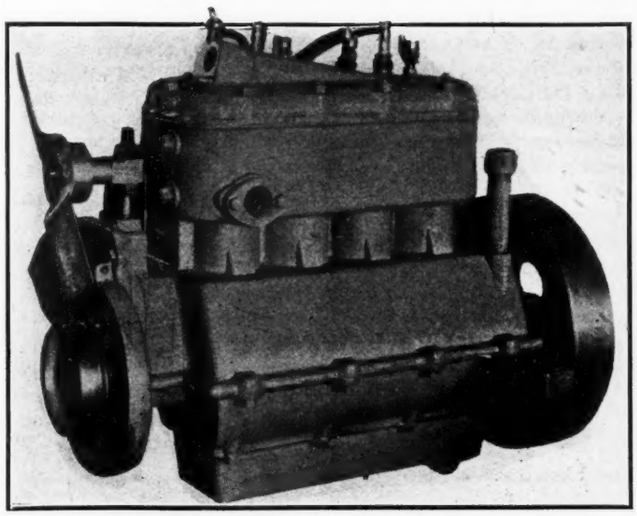


Fig. 5—Badger four-cylinder water-cooled block motor

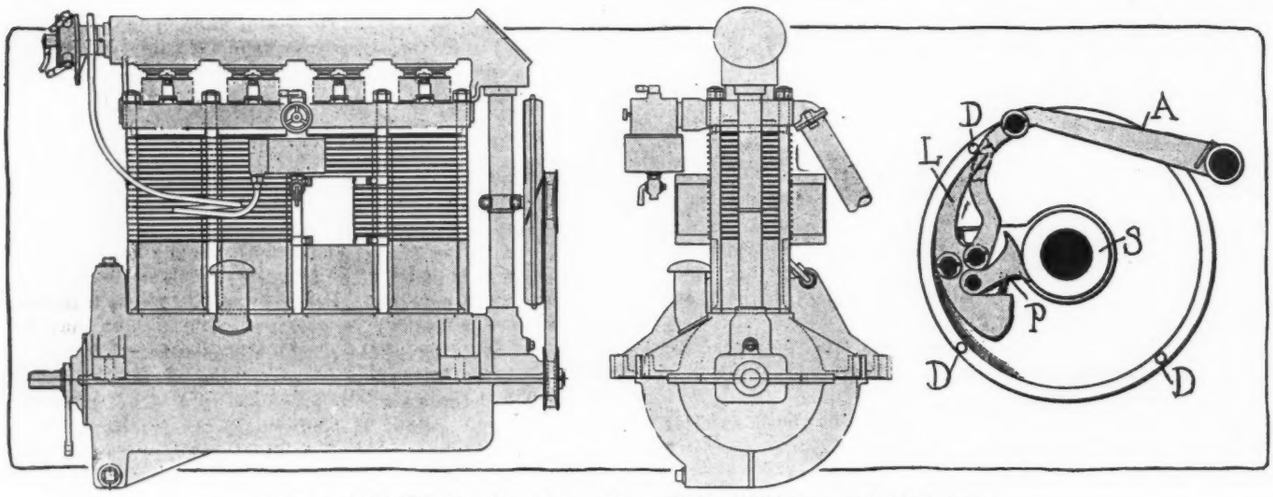


Fig. 6—Left—Thorne air-cooled motor. Right—Wilkinson mechanical starter

nickel plated brass without the possibility of the plate scaling. In other words, it is a white alloy which when polished presents an appearance identical with that of sterling silver except that it is not appreciably affected by the atmosphere.

B & L Lamps for Cyclecars

A lamp that is distinctively a cyclecar fitting is the product of the B & L Auto Lamp Co., New York City. The lamp is regularly supplied with a prismic lense that diffuses light so as to avoid the glare which is prohibited in so many cities. Plain glass is optional.

A plain glass insert at the outside of the lamp shows a clear white light to the side. The bulb may be removed from the socket without taking the lamp apart.

Siess Horn Low in Price

Seventy-five cents is the astonishingly low price of a mechanical diaphragm horn manufactured by the Siess Mfg. Co., Toledo, O. The sound is produced by a toothed wheel coming in contact with the diaphragm. The horn is finished in black enamel and is provided with a suitable bracket to fit any car.

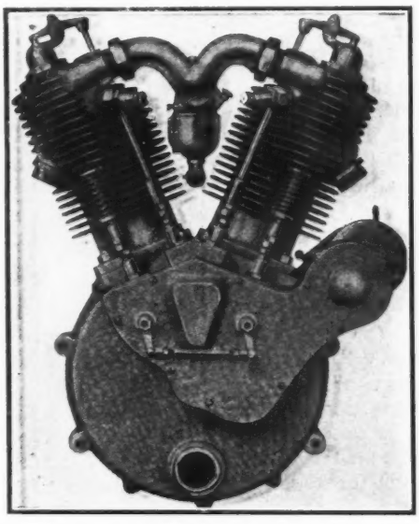


Fig. 7—Ives V-motor, air-cooled

Wilkinson Starter Simple and Cheap

Cranking the cyclecar motor from the seat either by means of a pedal or hand lever is made possible by a device known as the Wilkinson Mechanical Starter, Fig. 6, and which is being introduced in this country by Norman A. Pabst, 851 Woodward avenue, Detroit, Mich. The remarkable feature of this device is that it sells for $2. This is because of its extremely simple design.

When the cranking is done by a pedal, as illustrated, pressure on the pedal rotates the flywheel by engaging the lever L with one of the four dowels D in the flywheel rim. Pressure on the pedal raises the links A and this moves the top end of the lever L to the left and into engagement with dowel D, by means of the rod connecting these two members.

Movement of the mechanism due to a kick back in the reverse direction is obviated by the action of the eccentric pawl P which bears against the stationary collar S. When the direction of rotation is reversed, the pawl rides up on the collar and pushes the lever L out of engagement.

Uno Lighting System

The Uno Lamp Co., Chicago, Ill., has introduced a complete cyclecar lighting system which comprises a generator, 6 volt, 60-ampere storage battery combination side and headlights and a tail light and the necessary switches and other fittings.

The generator, Fig. 8, is 3.5 by 7 inches and weighs 7.5 pounds. It is stated that it will develop 4 amperes at 1,200 revolutions per minute, 5 amperes at 1,650 and 6 amperes at 1,800. The generator is water-proof and is equipped with a current cutout.

The complete outfit includes a dash switch of the flush type, flexible nickel conduits and 30 feet of wire. Mazda bulbs with Ediswan sockets are fitted.

The Royal Equipment Co., Bridgeport, Conn., is now prepared to furnish standard cyclecar brakes at very low prices. In addition to the standard brakes which are of the cam-operated, expanding type, the company will make special brakes to specifications.

Coil Springs Replace Leaf

Coil springs that take the place of leaf springs, and that are said to have superior riding qualities for cyclecar work, are offered by the Auto Machine Co., Canisteo, N. Y. These springs are made in the form of both half and full-elliptic springs. In the former the coils are arranged at each end while in the latter the coils are each side of the axle clip.

Du Pont Fabrikoid is a material especially designed for upholstering cyclecar bodies. It is water, grease and sun-proof and superior to split leather, it is stated. Enough material to upholster one car can be obtained free. It is manufactured by the Du Pont Fabrikoid Co., Wilmington, Del.

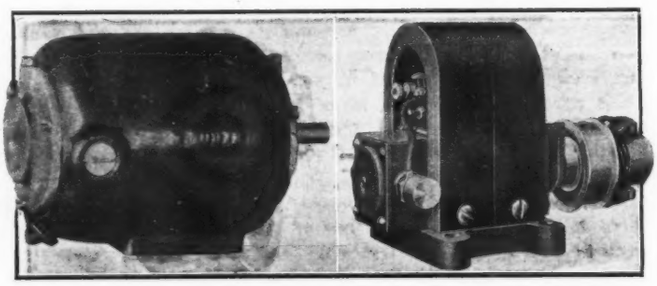


Fig. 8—Left—Uno lighting generator. Right—Eureka lighting generator

Cornelian Enters the Light-Car Field

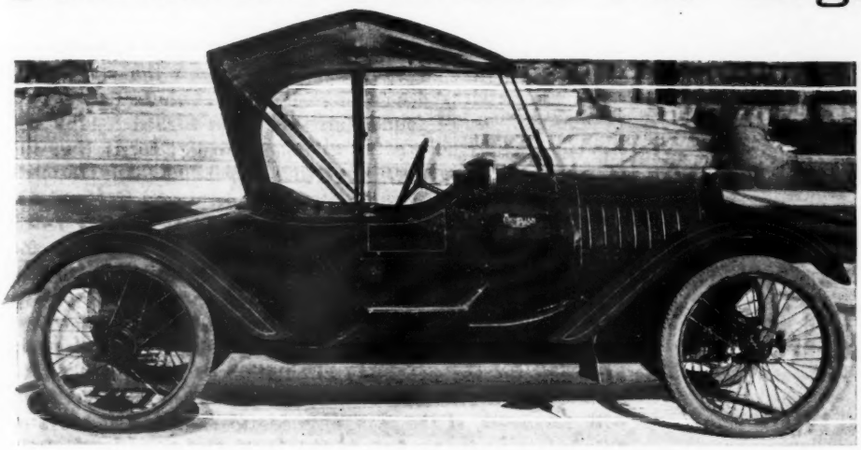


Fig. 1—Cornelian light car manufactured by Blood Bros., Kalamazoo, Mich.

Four-Cylinder Block Motor 3¾ by 4—Standard Tread—Side-by-Side Seating —Automatic Advance Spark

NO vehicle has been brought out through the inspiration of the cyclecar movement which has more originality or more features of real interest than the Cornelian light car, Fig. 1, made by Blood Bros., Kalamazoo, Mich., and designed by Howard Blood.

This car is above the cyclecar limit in weight and piston displacement, weighing slightly over 900 pounds and having a 95-cubic inch, four-cylinder, water-cooled motor; two-speed-and-reverse gearset, shaft drive, differential and all car features, including standard tread.

The body is formed of sheet steel so that it forms both body and frame, being at the same time very strong and roomy with good lines. The driver and passenger sit side-by-side in a wide seat with no necessity of crowding.

The seat, Fig. 4, is made in a new way, the back and seat proper being sprung together so that the passengers' backs are not continually rubbing against the cushion, but the back moves also. This seat is hung on at springs S underneath.

Three Cross Springs at the Rear

Further springing is obtained by the method of car suspension, the car being hung on cross springs fore and aft. These are long and resilient, as allowed by the standard tread width, and are firmly fastened to the body. At the rear there are three cross springs so that radius rods are done away with, the three springs forming a triangle with considerable fore-and-aft strength. The bevel gear reduction and differential are held in a housing B, Fig. 2, at the center of the springs, S and S, and shafts, connected by leather universal joints L extend from this to the hollow hubs of either wheel, the outer universals L in the wheels being at the extreme outside of the hub, in the hub cap, thus leaving the shafts as long as possible to give the minimum angularity.

Two Speeds and Reverse

The gearset has been described before, and gives two speeds and reverse with but three gears in the makeup. These are two small spurs and an internal gear, which altogether make a very light and compact arrangement. The controls are simple, and are standard.

The fenders are new in shape, self-reinforcing and have been named ridge roof fenders. These have a very small wind resistance, and, by their shape, with a definite edge, are very efficient.

The steering gear, Fig. 3, is arranged with a roller chain wrapping about a drum at the front of the car, fitted with springs at either end of the rods connecting to the chain, and, while not entirely irreversible, is sufficiently so that road shocks do not tend to affect the wheel.

Automatic Spark Advance

The motor is a four-cylinder block, 3 3-4 by 4 inch one fitted with automatic spark advance and has more power than is really needed, the car making over 50 miles per hour and holding the road with no difficulty at that speed. There are very few occasions where low gear is used.

The car made the run from Kalamazoo to Chicago a few days ago, a 178-mile trip, in 8 hours, having no mechanical trouble and no punctures.

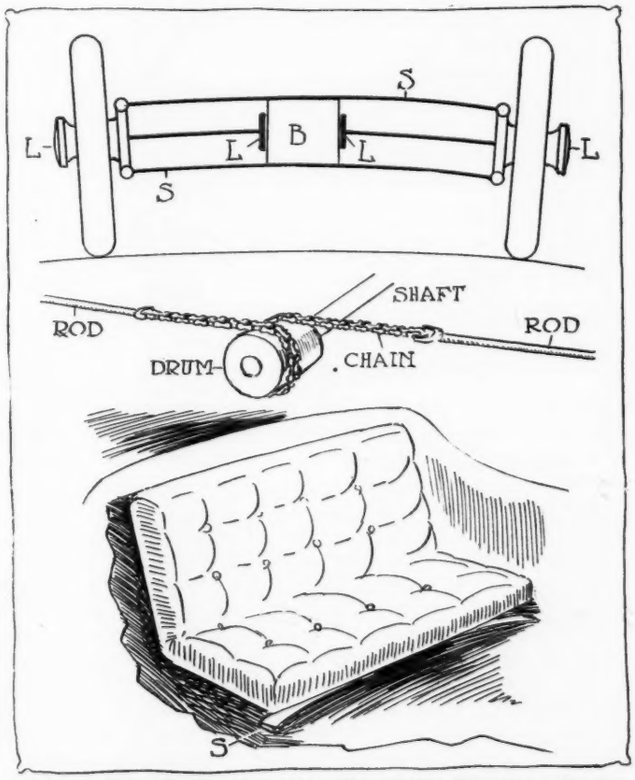


Fig. 2—Top: Rear axle construction of the Cornelian, showing leather universal joints, L, connecting the shafts. S and S1 are springs. Fig. 3—Middle: Steering gear arrangement. Fig. 4—Bottom: Seat and back combination. S is a flat spring.

The Rostrum

Wheels Should Be Same Size and Weight in Tests

EDITOR THE AUTOMOBILE:—I noticed in an article published in THE AUTOMOBILE, April 9, describing a test of steel, wood and wire wheels, in which the steel wheel showed to advantage in that wheels of different sizes were used and I consider the test highly unfair and practically meaningless because of this. The Crown Prince steel wheel was 35 by 4.5 inches, the wood wheel 34 by 4, and the wire wheel which I think was a McCue, 36 by 4.5.

As a champion of the wire wheel, the test to my mind is manifestly unfair, insomuch as they subjected a wire wheel of greater diameter to the strains of the testing machine than the steel wheel. Then, again, there is no comparison of weights between the different wheels and I understand that the wire wheel is materially lighter than the steel construction.

I think it is up to the Houk Mfg. Co., to show the relative merits of the different wheels and not permit a test of this nature to go unchallenged.

The public is hungering for data in regard to wire wheels and it seems to me that if the results of the Crown Prince test are not analyzed carefully the claim of superiority in the wire wheel will suffer unjustly. I would like to see a test made giving weights of the different wheels and using them all of the same diameter, preferably 34 by 4 inch sizes.

Chicago, Ill. THOMAS BOVEY.

The Obviousness of Adjustments

Editor THE AUTOMOBILE:—The recent letters in the Rostrum on how the modern car can be improved calls attention to a subject that is, to my mind, very important and interesting. I have had several experiences in my few years of motoring that have been along this line.

One feature of construction that is worthy of more consideration is the obviousness of adjustments. It is very hard sometimes for a man to pick out the nut to turn to loosen or tighten some certain part. This is not true of the average owner alone, but I have found that many experienced repairmen have the same trouble when a car is brought to them, that they are unfamiliar with, for repairs or adjustment. When a man has to spend half an hour or more to determine how to remove the self-starter or adjust the clutch, as often happens, it seems to me that it is about time that something was done to expedite matters.

A book could be written on this subject, but for brevity's sake I will just give one illustration of what I mean. Not long ago I was out in the country many miles from the nearest garage when my clutch began to slip, the trouble finally becoming so severe that it was almost impossible to make any headway. I pulled up the floor boards and looked around for the clutch adjustment but could not find it. Apparently there was none, and as I was unfamiliar with the car I was about to phone for a tow car when I observed a small screw, hidden by grease and dirt in the rim of the flywheel, that looked as though it was put there for no purpose at all. But I found that this screw turned readily and was pleased to note after giving it several turns that the clutch ceased slipping. Yet this important little member was so hidden that I came near missing it and if I had not been certain that there was a clutch adjustment, I never would have found it. A larger screw or an arrow or the words, clutch adjustment, would have saved all this trouble.

Another feature of car design that should be improved is ventilation. Many cars are perfect in this particular but there are many more that have no provision or inadequate provision for the necessary circulation of air that must be maintained in the front compartment on a car equipped with foredoors, if the occupants are to have any comfort in summer. The ventilation of the front seat is a simple matter and can be satisfactorily accomplished in a great many ways, yet there are many manufacturers that are still overlooking this important point.

New York City. C. S. T.

$1,000 Cars with 34-Inch Wheels

Editor THE AUTOMOBILE:—1—Is there a car on the market with 34-inch wheels, and pneumatic tires selling at $1,000 or less?

2—What car, if any uses the Deltal engine? Who designed this engine?

3—What will the probable price of gasoline be at retail this summer in the vicinity of New York City?

4—Which is the better decarbonizer, kerosene or alcohol?

5—How long should a fully charged storage battery be allowed to stand without recharging provided no current is drawn from same?

6—What effect will allowing a fully charged battery to stand idle for a long time have on the battery?

7—Why has a five-cylinder motor never been tried in a motor car?

It would seem to me that such a motor would possess all the smoothness and freedom from vibration of the six with considerably less weight and complication. I will admit that a crankshaft for a five would be more expensive than one for a six, but would not the greater saving in weight, length of motor, fewer parts, etc., more than make up for the greater manufacturing cost of the crankshaft?

East Canaan, Conn. D. C. CANFIELD.

—1—The following cars are equipped with 34-inch tires and sell for $1,000 or less. The Coey, price $995, tires 34 by 4, made by the Coey Mitchell Auto Co., Chicago, Ill.; The Dispatch, price $900, tires 36 by 3.5, made by the Dispatch Motor Car Co., Minneapolis, Minn., The Meteor, price $950, tires 34 by 3.5, made by the Meteor Motor Car Co., Shelbyville, Ind.

2—The only car using the Deltal motor is the racing car of that name. The motor was designed by E. H. Delling, now chief engineer of the Mercer Automobile Co., Trenton, N. J.

3—From 20 to 22 cents.

4—Kerosene is a better decarbonizer than alcohol although the latter is quite satisfactory. The action of both these liquids is to dissolve the oily material that binds the carbon particles, and kerosene is a better solvent than alcohol. Neither substance has any solvent action on the carbon itself.

5—About a month is as long as it is advisable to allow a battery to stand without recharging.

6—When a battery is not in use some of the water in the electrolyte evaporates and the acid goes into the plates. In order to bring the battery back tc normal it should be charged.

7—Five-cylinder motors have been experimented with for both automobiles and motor boats, but have never been a success, because the five-cylinder lacks balance. In both the four and the six, the reciprocating masses are paired off so that good balance is secured but since five is an odd number, this is not possible in the five-cylinder motor. This was fully discussed in THE AUTOMOBILE for April 9.

Tag for Repair Work

Editor THE AUTOMOBILE:—I note that from time to time you have published in your journal various methods of taking care of repair work in the garages. I have just drawn up a tag, Fig. 1, which I think takes care of everything in the average garage, and with which I have great success. I have used various systems in my garage and find this one the most satisfactory and thought that perhaps it would be of some benefit to other garages.

Winthrop, Mass. J. C. MCMURRAY.

How To Adjust the Carbureter

Editor THE AUTOMOBILE:—1—I have a two-cylinder truck. It is equipped with a model D Schebler carbureter and Remy magneto. It does not pick up speed right. It runs well on high and low but when I give it more gas it misses. There is a hole in the bottom of the intake manifold where it branches to go to the two cylinders. Do you think that this can be the cause of the trouble.

2—Will you please tell me how to adjust a model D Schebler carbureter?

3—The truck does not back right, especially when it is driven up a little hill. When I throw in reverse it will start to back all right and then it will stop and the motor keep right on going.

Vineland, N. J. W. J. EASTBURN.

—1—The missing of your motor is at least partly due to the hole in the manifold. This allows air to leak in and produces a weaker mixture. At the same time the carbureter or ignition system may be at fault. Adjust the breaker points on the magneto, inspect the wiring, examine the plugs for cracked porcelains, clean them and adjust the spark gaps.

2—Retard the spark, open the throttle about one-fourth, so as to equal the size of the fixed air opening. Start the motor and adjust the needle valve, shown at the bottom, Fig. 2, until the motor runs smoothly without backfiring, or missing. Then open the throttle wide, keeping the spark retarded and by turning the valve adjusting screw, shown at the top, increase or decrease the tension on the air valve spring until the proper mixture is obtained. If the mixture is too rich, as indicated by smoke at the exhaust or a sluggish operation of the motor, the spring should be weakened and if the mixture is too weak, as shown by the motor backfiring, weaken the spring.

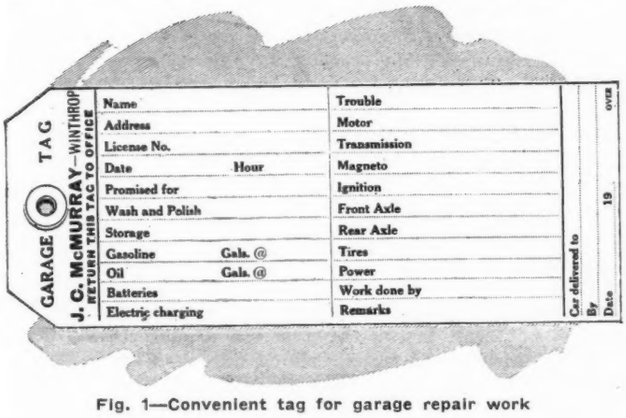


Fig. 1—Convenient tag for garage repair work

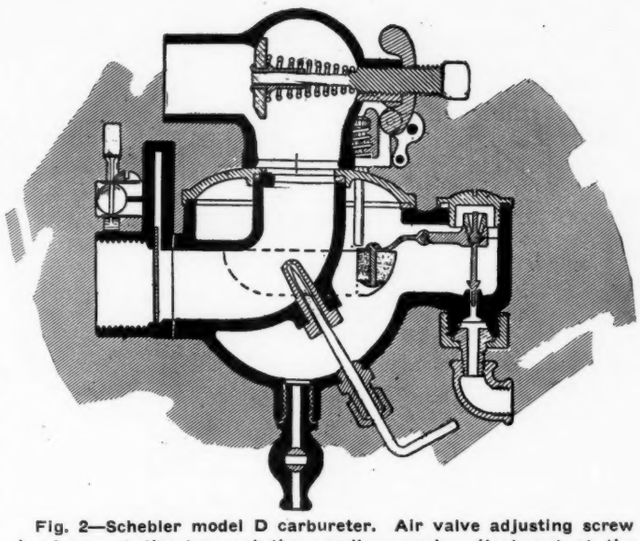


Fig. 2—Schebler model D carbureter. Air valve adjusting screw is shown at the top and the gasoline nozzle adjustment at the bottom

3—You are not very clear as to the symptoms that present themselves when the car is reversed. The trouble is probably due to a slipping drum, which may be caused by a loose or worn band. Adjust the band and if the trouble continues reline it.

The Care of the Storage Battery

Editor THE AUTOMOBILE:—Will you kindly let me know whether it is necessary or advisable to have a storage battery inspected by the maker at stated intervals and whether such inspections will be likely to prolong the life of the battery? My car is equipped with the Gray & Davis lighting and starting system with a Willard battery and I average 100 miles a week. The battery is apparently in perfect order after a year's use but I am wondering if it needs attention.

Nutley, N. J. J. P. H.

As long as your battery does not give trouble there is no need for taking it to the maker for inspection. Periodical inspection by the maker would not increase the life of the battery very much, if at all.

Keep the specific gravity between 12.75 and 13.00 Beaumé, by testing the electrolyte occasionally with a hydrometer. If it is lower than this amount add sulphuric acid while if higher, distilled water.

Ratio of Clearance to Piston Displacement

Editor THE AUTOMOBILE:—1—Can you give me the proportion of clearance to piston displacement for compressions of 80 and 90 pounds?

2—Can you give me a formula for calculating isothermal compression without resorting to the use of logarithms?

3—What is the compression usually employed in water-cooled aeronautic motors?

Hamilton, O. WALTER S. THOMPSON.

—1—The ratio of clearance to piston displacement is .37 with 80 pounds compression and .33 with 90 pounds. This is assuming that the compression is adiabatic, that is, that there is no exchange of heat between the charge and the walls of the cylinder during compression. This is not strictly true but it gives a more accurate result than would seem possible at first glance because although there is a flow of

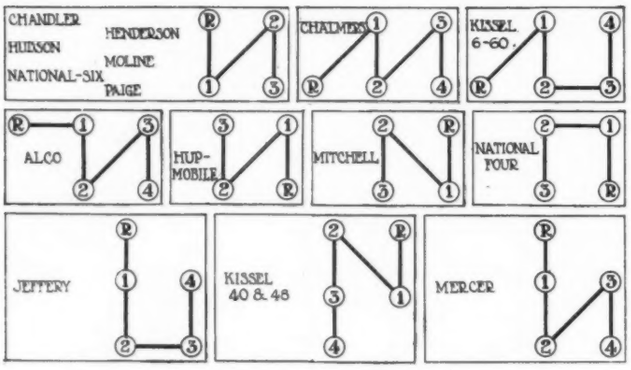


Fig. 3—Gear lever positions on various makes of cars

heat from the cylinder to the charge during the first part of the stroke, during the second part the flow is in the opposite direction, because the gas becomes heated during compression to a temperature higher than the cylinder walls. The result is that the net amount of heat transferred is very small.

The ratios given above are simply arrived at by transposing the ordinary expression for the adiabatic compression of a gas.

$$p_1 v_1^k = p_2 v_2^k$$

where

p_1 = the pressure of the gas at the end of the suction stroke. For the purposes of calculation this can be taken at approximately atmosphere or 15 pounds per square inch.

v_1 = the volume at this pressure.

p_2 = the compression pressure.

v_2 = the volume at this pressure, that is, the clearance.

k = a constant, which for air is 1.406.

Dividing by $v_2^k p_1$ we have:

$$\frac{v_1^k}{v_2^k} = \frac{p_2}{p_1}$$

Taking the k root of this equation we obtain:

$$\frac{v_1}{v_2} = \sqrt[k]{\frac{p_2}{p_1}}$$

$$v_1 = v_2 \sqrt[k]{\frac{p_2}{p_1}} \qquad (1)$$

The ratio of clearance to piston displacement is expressed by:

$$R = \frac{v_2}{v_1 - v_2} \qquad (2)$$

Since

v_2 = the volume at upper dead center

and

$v_1 - v_2$ = the piston displacement or the difference in volume between in and out positions of the piston.

Substituting the value of v_1 expressed in equation (1) in equation (2),

$$R = \frac{v_2}{v_2 \sqrt[k]{\frac{p_2}{p_1}} - v_2}$$

$$R = \frac{1}{\sqrt[k]{\frac{p_2}{p_1}} - 1}$$

If 80 pounds gauge compression is employed and atmospheric pressure is taken to be 15 pounds, then $p_2 = 15 + 80 = 95$ and $p_1 = 15$.

Substituting these values in the above equation, and placing $k = 1.406$, its value for air.

$$R = \frac{1}{\sqrt[1.406]{\frac{95}{15}} - 1} = .37$$

2—Isothermal compression can be calculated by the formula

$$p_1 v_1 = p_2 v_2 \qquad (1)$$

where

p_1 and v_1 equal the pressure and volume at the outer position of the piston and p_2 and v_2, for the inner position.

The ratio of compression, R, is expressed as follows:

$$R = \frac{v_2}{v_1 - v_2} \qquad (2)$$

Substituting for v_1 in (2) the value of v_1 expressed by (1),

$$R = \frac{v_2}{\frac{p_2}{p_1} v_2 - v_2} = \frac{1}{\frac{p_2}{p_1} - 1}$$

3—The average compression is 70 pounds.

Questions on 1911 Lozier

Editor THE AUTOMOBILE:—1—I have a four-cylinder Lozier 1911, 5.375 by 5.5-inch bore and stroke. What is the horsepower, do you think?

2—How much oil would you carry in the crankcase?

3—How many drops to the minute should be fed?

4—Can I use a low-tension K-W magneto with this engine, after starting on dry cells, with results?

Brockton, Mass. JAS. CURLEY.

—1—According to the modified S. A. E. formula, which takes into account the stroke and revolutions per minute as well as the bore and number of cylinders, the horsepower is 64, assuming that the speed is 1,500 revolutions per minute.

This formula gives as accurate a result as can be obtained without an actual test. It is expressed as follows:

$$\text{H. P.} = \frac{D N S R}{15{,}000}$$

Where D = bore in inches

N = number of cylinders

S = stroke in inches

R = revolutions per minute

2—About 5 pints.

3—Between three and five drops per minute.

4—Yes. The K-W magneto should prove satisfactory.

Change Gear Lever Positions

Editor THE AUTOMOBILE:—Please publish in the Rostrum how to obtain the different speeds on the following cars: Chandler, Hudson, National, Henderson, Moline, Paige, Chalmers, Kissel, Alco, Hupmobile, Mitchell, Jeffery and Mercer.

Philadelphia, Pa. JOSEPH REILLY.

The positions of the shifting lever for the different speeds on the cars you mention are given in Fig. 3. The top of the diagrams indicate the forward positions and the bottom, the backward positions.

A study of these diagrams reveals many interesting points and shows that while there are many styles of diagrams, only two plans are followed in their design. If the positions of the lever for the various speeds are considered merely as points, and these points are connected in order, so that beginning with reverse, the line will pass through first, second, third and fourth if there is one, then it will be seen that the lines connecting these points form either an N or a U. It will also be noted that the majority are N-shaped.

This analysis is of value where it is necessary to determine the positions of the change-gear lever on a car that one is not familiar with and where the positions are not marked, without the trouble of meshing the different gears. With the U and N diagrams in mind, it is possible to determine the layout of the gate by inspection, invariably.

For instance, where a three-speed gearset is employed, the determination is simple, as a rule. The reverse notch is easily located, usually, by there being some sort of detent to prevent the operator from moving the lever into this position inadvertently. Furthermore, the high-speed notch is generally shorter than the others, due to the fact that a shorter movement is required to engage the dog clutch, used for high, than it takes to mesh the gears. Now referring to the figure it is seen that when these two speeds are known, the other two can be determined. For example, if reverse and third are diagonally opposite each other, the movement of the lever describes the letter N in progressing from reverse to third. In this case first is always directly opposite reverse and second opposite third.

If the movement describes a U, as is illustrated by the National four, then reverse and third are both forward or backward, and second must be opposite third and first opposite reverse.

The same reasoning can be applied to the four-speed sets.

Safe Water-Jacket Temperature

Editor THE AUTOMOBILE:—At what heat of water does a water-cooled automobile engine run without injury to cylinder walls?

2—What disadvantage, if any, would there be in using a 2-inch flat valve, as advised for cyclecar and described in your issue of February 19, page 448? Is this type best adapted to intake valves?

Cleveland, O. L. E. L.

—1—In general it is best to keep the water around 180 degrees, although the maximum temperature at which it is safe to allow the cooling water to rise to without danger of injury to the motor depends on the design of the motor, the grade of oil used, the conditions of operation and the adjustment and condition of the various engine parts.

Some engines will operate satisfactorily even when the water is boiling, the only objection to doing this being the danger of the water boiling away. If the oil can stand the heat when the water is near the boiling temperature, and there is no carbon to cause pre-ignition, a motor may be safely operated at this temperature, in fact, there is a certain make of small stationary engine that is designed so that the cooling water boils at all times.

The difficulty with operating the motor so near the boiling limit is that when an overload occurs, the water will boil away. If the mixture is too rich or there is carbon in the cylinders, the motor will knock quicker than if the water were cooler. Also if anything should go wrong with the lubricating system, or cooling system for that matter, there would be greater danger of injury to the motor, as the parts would seize more quickly.

2—The objection to the use of the flat valve is that when foreign matter lodges on the seat it is more liable to stay there, will prevent the valve from seating and will thus cause a leak, while with the conical seated valve, any dirt will roll off.

This type of valve is better adapted to the motor intake because there is less possibility of dirt interfering with the valve operation but it is preferable to have both valves the same.

Explanation of Perfex Ignition System

Editor THE AUTOMOBILE:—1—Will you please explain the operation of the Perfex ignition system?

2—Who makes this system?

Brooklyn, N. Y. F. P. W.

—1—The Perfex ignition system is a unit coil system using a master vibrator and is designed for operating on current furnished by batteries and magneto generator. It differs from the ordinary coil system, however, in that each coil is a unit with a spark plug, thus eliminating all high-tension wiring. As shown in Fig. 4, the coil is mounted above the plug in a waterproof case. The plug parts are so designed that they can be removed and replaced, so that it is not necessary to buy a new coil when a spark plug gives out.

A diagram of the complete system is shown in the figure. The master vibrator is contained in the top of one of the coils. A two-point switch allows current to be supplied by either the magneto or the batteries.

The timer is for the purpose of timing the spark and distributing the current to the proper cylinder. A rotating brush on the timer shaft makes contact with each of the four segments in turn. It runs at half crankshaft speed and is positively driven by the engine so that the sparks occur at the right time.

The low-tension coil of each unit is connected across the terminals A and B and the master vibrator is connected across the points B and C. It will be noted that the vibrator is connected in parallel with the four coils so that it operates, no matter what coil is receiving current. Suppose that the circuit to the cylinder in which the coil with the master vibrator is installed, is closed, then the current will flow from the current source, through the two-point switch, through the master vibrator, which is located between B and C, and the low-tension, coil connected between C and A through the timer wire to the brush and from thence to the ground.

When the brush completes the circuit to one of the other coils, the current flows between the terminals B and C, through the master vibrator, the same as before, but here it branches and flows out through wire D to one of the other coils, and then through the timer back to the frame.

2—The Electric Goods Mfg. Co., Canton, Mass.

Paint Rims with Graphite

Editor THE AUTOMOBILE:—What is the best paint to paint automobile rims to keep them from rusting? How will shellac do, or will it injure the tube if it comes in contact with it.

Lockport, N. Y. W. W. TREVOR.

Shellac will not answer. The outside of the rim, that is the part that does not come in contact with the tire may be enameled, or coated with aluminum bronze. Any high-grade, elastic enamel will do. Before applying the enamel, the rims should be sandpapered to remove the rust.

The parts of the rim that touch the shoe or tube should be painted with flake graphite mixed with enough gasoline or oil to make a paste. The graphite not only keeps the rim from rusting but it prevents the tire from sticking.

One end of each high-tension coil is attached to the central electrode of the spark plug and the other is grounded.

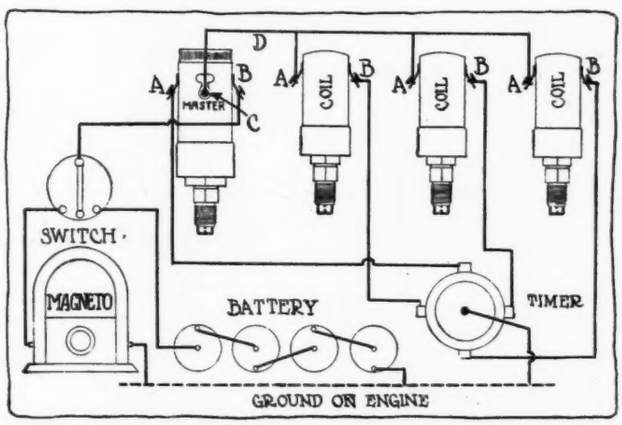


Fig. 4—Wiring diagram of Perfex ignition system

The Engineering Digest

Stress Chart Figures Clinch Theory Demanding Built-Up Crankshaft In Rocking Ball-Bearings

A LEAF FROM HIGH-SPEED MOTOR BOOK GOOD FOR REFINING MASSIVE MOTORS TOO

AS WELL known, some of the largest automobile manufacturers in Europe are very slow in embracing the gospel of the powerful small motor of extremely high speed. They prefer to take advantage of the improved technique by degrees, so as not to be taken unawares by new troubles, now that the public has become accustomed to get along with a type of motor which works reliably and faithfully if not with the utmost efficiency and fuel economy. It is especially vibrations and their results which crop out in unexpected or aggravated forms when both the rotary and the piston speeds are increased without the simultaneous adoption of painstaking precautions for refining the balancing of the motor. When, for a rough example, the speed of a motor is increased by simply enlarging the dimensions of valves, ports and conduits, it is always found that the high speeds are impracticable because they shake the vehicle intolerably. As the valve-setting suitable for high motor speed also differs considerably from that which is best for a larger motor pulling the same load, it has come to this that the radical ultra-high-speed motors are always small, so that it will never be necessary to run them below the range of speeds for which they are fitted. Even their most ardent advocates admit that they are better adapted for touring than for city traffic, while some of their opponents attempt to maintain that equal fuel economy may be obtained with slow motors if the refinements which make the high speed possible—light reciprocating parts, short stiff shafts, large valves, overhead camshaft, etc.—are adopted for the slow motors as well. Under these circumstances, and with the sleeve-valve motor as a further possibility in the development, as well as the perfected two-cycle motor and the semi-Diesel motor, most conservative manufacturers take a middle course, having since 1906 added about 50 per cent. to the length of the piston stroke while almost doubling the piston speed, and even this relatively moderate change has brought to attention a number of points, in the matters of lubrication, silence, durability, etc., on which some refinement immediately became necessary when the speed was increased.

Every manufacturer being confronted with the necessity for a choice, with regard to the degree in which he shall follow the tendency toward high speed and the adoption of the design features which are compulsory with it, or as to whether he shall seek the solution of the annually reverting conundrum in some other direction, there is occasion for drilling one's mind to a correct intuitive perception of relative values among the many different factors involved in a change, especially as the final conclusion may be in favor of a motor no smaller than those used now by conservative manufacturers and yet intrinsically as fast as the fastest, except for the valve-setting and a restraining governor; in which case all the improvements practiced in the high-speed camp would be adopted, partly to create a reserve power but mostly to make the motor run more smoothly and noiselessly at its relatively low normal speed than any motor which is pushed to its extreme capacity can possibly do.

Somewhat from this standpoint, the digest of an article by Th. Lehmbeck on harmonic vibrations of crankshafts and other shafts in automobiles was presented in these pages in the issue of April 9. A continuation, going more deeply into details, is given in the following.

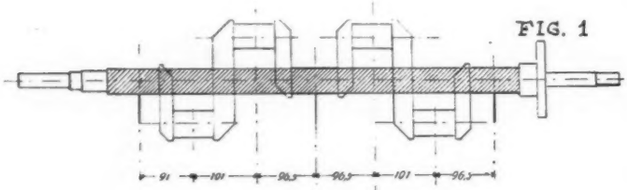


FIG. 1

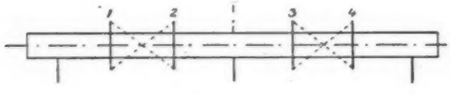


FIG. 2

Common Errors

When Knight first used the chain for driving a camshaft, every designer ascribed the silence of the drive to the chain, and even now few seem to realize that the principal reason for the silence may lie in the almost uniform resistance of the two sleeve-valves, as compared with the intermittent pushes of an ordinary camshaft, which react on the teeth of the camshaft gears.

In the effort to make everything as light as possible, the amount of metal in camshaft gears has usually been reduced, though they had better be made large and heavy to have their turning moment absorb the irregularities in their work. A larger diameter would also make the pressures on the teeth smaller. Formerly, with slower motors, small gear wheels were more satisfactory. The cams had gentler curves and the valve springs were weaker. The demands made upon them have grown with the speed, and likewise for the camshafts; where formerly a shaft of 20 millimeters sufficed, one of 25 to 30 millimeters is required today, and with shorter distance between the bearings, at that.

Facts and Figures

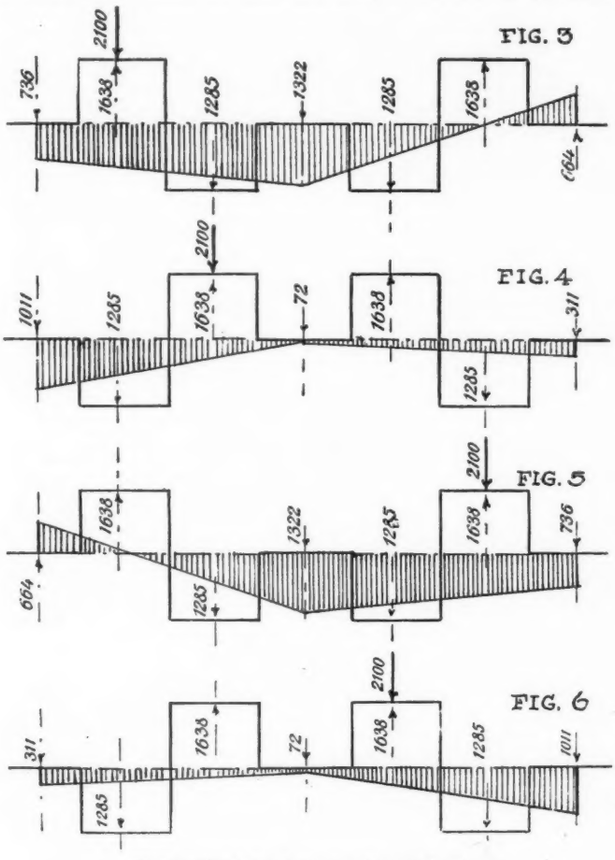
Calculation of the forces which comes into play in an automobile motor is now necessary to arrive at a lifelike idea of what the true requirements are if vibrations, wear and noise shall be avoided. As an example one of the best known German automobile motors is selected. It has 95 by 140 millimeter bore and stroke and the three-bearing crankshaft has a diameter of 41.96 millimeters. The other dimensions of the shaft are shown in Fig. 1.

The centrifugal forces are composed of those acting upon the axial portion of the shaft, as shown by hatching in Fig. 1, and caused by the outside portions of the crankarms and pins, and those caused by the connecting-rod knuckles acting upon the crankpins. The crankpin radius is 70 millimeters. Accordingly, when the weights acting at this radius are estimated at 3 kilograms per crank, we have, for a rotation speed of 1,800 revolutions per minute, a centrifugal force P_c, as follows:

$$P_c = \frac{3 \times 0.07 \times 1800^2}{900} = 756 \text{ kilograms.}$$

The planes in which the two components of the centrifugal forces act are removed respectively 91 and 96.5 millimeters from the middle planes of the bearings and at the same time 101 millimeters from each other. Through this fact a bending moment in the crankshaft is produced, and while it may apparently be completely resisted through the robust dimensions of the shaft, it is yet there and may supplement other forces. Fig. 2 indicates how the centrifugal forces 1, 2, 3 and 4 are distributed. They are symmetrical with relation to the bearings as well as to the axis of the shaft.

The inertia forces are much more dangerous, as producers of shaft vibrations, as they are distributed unevenly, being



Stress chart for 4 successive explosions

considerably greater for the upper halves of strokes than for the lower halves and therefore not symmetrical with relation to the axis of the shaft. As well understood, this difference varies with the relation between the length of the connecting-rod and the crankthrow. In the present case the connecting-rod is 280 millimeters long and only four times as long as the crankarm. The weight of the piston together with the connecting-rod, excepting the knuckle which is figured as belonging to the crankshaft, may be taken as 2.8 kilograms.

To arrive at the inertia, the centrifugal force is first figured. At 1,800 revolutions we have:

$$P_i = \frac{2.8 \times 0.07 \times 1800^2}{900} = 705.6 \text{ kilograms.}$$

and for the existing relation between the lengths of the connecting-rod and that of the crankarm this value must be multiplied by 1.25 to get the inertia at the upper dead center and by .75 for the lower center. These forces are thus respectively 882 and 529 kilograms.

Adding the centrifugal forces arising from the crankshaft itself, with the connecting-rod knuckles included, it is found that at each crank which is turned upward there is a pull of $882 + 756 = 1{,}638$ kilograms and at each crank turned downward a pressure of $529 + 756 = 1{,}285$ kilograms. Fig. 7 shows how these forces take effect upon the crankshaft. The dotted lines representing the stresses no longer intersect in the axle but above it. So long as the shaft is firmly mounted in its three bearings it must therefore be subject to small flexions in an upward direction which result in vibrations and whose highest values lie exactly midway between the two pairs of bearings in the manner indicated in Fig. 7 by dotted curves.

Argument for Ball-Bearings

Naturally, a bearing which cannot participate in these vibrations will not continue to fit very long. With ball-bearings arranged to oscillate freely with the shaft the matter stands differently. [The author here alludes to a patented ball-bearing of his own design and also to a well-known double ball-bearing of Swedish origin which has become widely used in Europe and in which the radius of the outer race, serving for both rows of balls, is the same for the transverse curvature as for the whole circle, so that it constitutes a zone of a sphere; but the author considers this transverse curvature insufficient for safe-guarding against wear and for strength.—Ed.]

The parallel bearing with its soft white-metal bushing soon accommodates itself to the vibrations, yielding where the stresses become too great. The "limbering up" or "running in" of the bearings which usually takes place in the factories means nothing more than spinning the bushings into that double-conical shape in which they will not oppose a strong resistance to the vibrations of the shaft. For the same reason it is of no use to scrape and align all the bearings in a crankcase, if the object is to avoid heating. And in the case of the phosphor-bronze bearings which gave good service in low-speed motors, the same action—the shaft vibrations—is responsible for the fact that such bearings now run hot, burn fast to the shaft and score it. That the direct pressures upon the bearings, which are usually blamed for these results, are not in reality severe enough to account for them will appear from the figures presented in the following.

Stress Calculations

In an automobile motor the explosion pressure is at most about 30 atmospheres; usually not more than 25. With a piston diameter of 95 millimeters, as in the case here supposed, the pressure at the moment of the explosion would at the rate of 30 atmospheres amount to 2100 kilograms. Figs. 3, 4, 5 and 6 represent two complete turns of the shaft. The heavy arrow indicates in each case on which crank the explosion pressure acts, the order of firing being 1, 2, 4, 3. The arrows in dotted lines show the directions of the forces of inertia and centrifugality, while their magnitude in kilograms is written in numerals. The vertical lines from the axis indicate the distribution and directions of the pressures upon the shaft, and it is noticed that they are mainly acting in a downward direction. Only in Figs. 3 and 5 is there an upward pressure in one of the end-bearings.

In most of what has been written on this subject the influence of the distance between bearings and between pressure centers has been ignored, yet this factor must be considered in order to get an idea of the true conditions, especially with reference to vibrations. The figures, as calculated for the crankshaft under consideration and representing these true conditions, are given in Table 1.

As will be understood by comparison with Figs. 3, 4, 5 and 6, the values found first for the right side of the shaft are subsequently repeated on the left side. In reality, it is seen, the pressures acting in the bearings fall far short of the explosion pressures. This observation is of the utmost importance for the correct choice of ball-bearings. [The author has previously argued that parallel bearings cannot be made to accommodate themselves to shaft oscillations readily

TABLE 1—CALCULATION OF THE DISTRIBUTION OF STRESSES ON A CRANKSHAFT OF NORMAL DESIGN, AT EACH OF 4 SUCCESSIVE EXPLOSIONS

Front Bearing	Cyl. 1	Cyl. 2	Middle Bearing	Cyl. 3	Cyl. 4	Rear Bearing
	+2100 kg	+1285 kg		+1285 kg	−1638 kg	
	−1638 „					
	+ 462 kg					
+ 308 kg			+ 154 kg			
+ 428 „			+ 857 „			
			+ 857 „			+ 428 kg
			− 546 „			−1092 „
+ 736 kg			+1322 kg			− 664 kg
	+1285 kg	+2100 kg		−1638 kg	+1285 kg	
		−1638 „				
		+ 462 kg				
+ 154 kg			+ 308 kg			
+ 857 „			+ 428 „			
			+ 428 „			+ 857 kg
			−1092 „			− 546 „
+1011 kg			+ 72 kg			+ 311 kg

enough.] Although the question is of a motor of rather large dimensions, the highest pressure at 1,800 revolutions does not exceed 18.6 kilograms per square centimeter, and when the same motor makes only 1,200 revolutions, the highest pressure in any bearing is 1,105 kilograms, which makes 15.6 kilograms per square centimeter of piston surface.

The usual method is to figure the piston pressure at 25 to 30 atmospheres and to calculate the bearing pressures directly from it, but by this method such exaggerated figures are arrived at that the use of ball-bearings seems to be out of the question. When, on the other hand, the inertia forces and the centrifugal forces which act only in one direction are duly considered, the results are obtained which are expressed in the figures just mentioned, and which are well worth noting.

While in the up or down direction the inertia forces and the centrifugal forces act together, the sides of the shaft bearings are affected by the centrifugal forces only. If these centrifugal forces are neutralized by placing counter weights oppositely to each crankpin, in the manner indicated in Fig. 10, the distribution of pressure shown in Table 2 is obtained.

TABLE 2—CALCULATION OF THE DISTRIBUTION OF STRESSES IN THE BEARINGS OF A CRANKSHAFT IN WHICH THE WEIGHTS OF THE CRANKS AND OF THE CONNECTING-ROD KNUCKLES ARE COMPLETELY BALANCED BY COUNTERWEIGHTS

Front Bearing	Cyl. 1	Cyl. 2	Middle Bearing	Cyl. 3	Cyl. 4	Rear Bearing
	+2100 kg	+ 529 kg		+ 529 kg	− 882 kg	
	− 882 „					
	+1218 kg					
+ 812 kg			+ 406 kg			
+ 178 „			+ 353 „			
			+ 353 „			+ 178 kg
			− 294 „			− 588 „
+1090 kg			+ 828 kg			− 411 kg
	+ 529 kg	+2100 kg		− 882 kg	+ 529 kg	
		− 882 „				
		+1218 kg				
+ 406 kg			+ 812 kg			
+ 353 „			+ 178 „			
			+ 178 „			+ 353 kg
			− 588 „			− 294 „
+ 759 kg			+ 580 kg			+ 59 kg

As will be noticed, a complete change of the stress conditions has taken place as compared with that shown in Table 1. The middle bearing was there charged with the lowest pressure, amounting to 72 kilograms, and in Table 2 this bearing receives an additional pressure of at least 508 kilograms. At the same time, the highest pressure which occurs, at one shaft end, is increased only by 79 kilograms, and this corresponds to 15.2 kilograms per square centimeter piston area.

At 1,200 revolutions per minute the bearing pressure arising at the firing of the first cylinder is + 1217 kilograms, + 753 kilograms and — 753 kilograms. At the firing of the second cylinder they become + 647, + 1112 and + 27 kilograms. The highest bearing pressure is thus at the end of the shaft and amounts to 18 kilograms per square centimeter piston area.

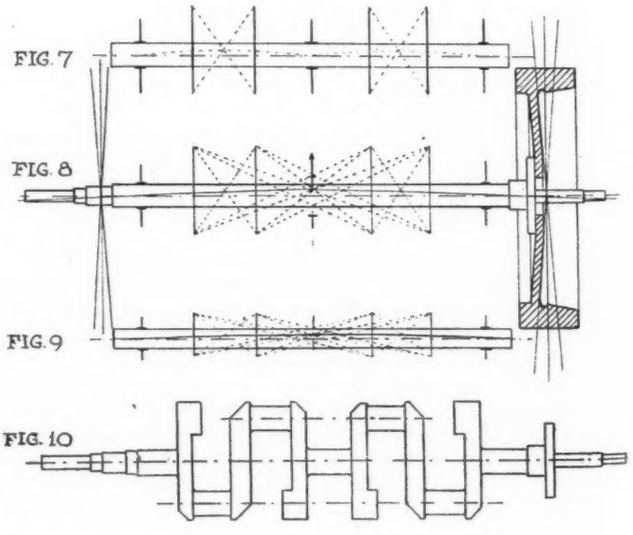
From these figures it appears assured that eventually crankshafts will be mounted in ball-bearings; namely, as soon as ball-bearings are made which have sufficient surface for being built directly into the aluminum case.

In Fig. 8 it is shown in what manner the vibrations are likely to take place with a crankshaft whose middle bearing has first been worn out by acting as a vibration center. Both the front and the rear ends of the shaft will then begin to take part in the oscillations and soon it will be observed that the lower half of the bushing in the front bearing is ovalized; eventually the flywheel begins to knock at high motor speeds. If finally the crankshaft breaks near the flywheel from these causes—coupled with that of unsuitable material —it will be seen that the fracture is long, while in the case of a break due to fatigue or harmonic vibrations it is short and smooth.

Fig. 9 indicates the action of a shaft in which the centrifugal forces have been balanced by counterweights, on the plan of Fig. 10 and as is now being done by a number of manufacturers, who would not do it unless they had found it necessary.—From *Auto-Technik*, April 11.

Purpose of Public Trials of Motor Implements in Europe

SAID the French minister of agriculture at a recent interview: "Do not forget that motor plows are already used in 10 counties in France, but in all these localities it is the Fowler equipment which is used, of which each installation represents an investment of from 90,000 to 110,000 francs. There is a place for machinery of infinitely lower cost. Well, by our numerous competitions for agricultural motor implements it is our purpose to force the creation of such motor machines for small husbandry; to encourage designers in the work of improving them. And marvelous results have already been accomplished, as will be more conclusively shown as soon as reports are available of the crops obtained from soil tilled last year with motor tools of some of the new designs."—From *L'Auto*, April 4.



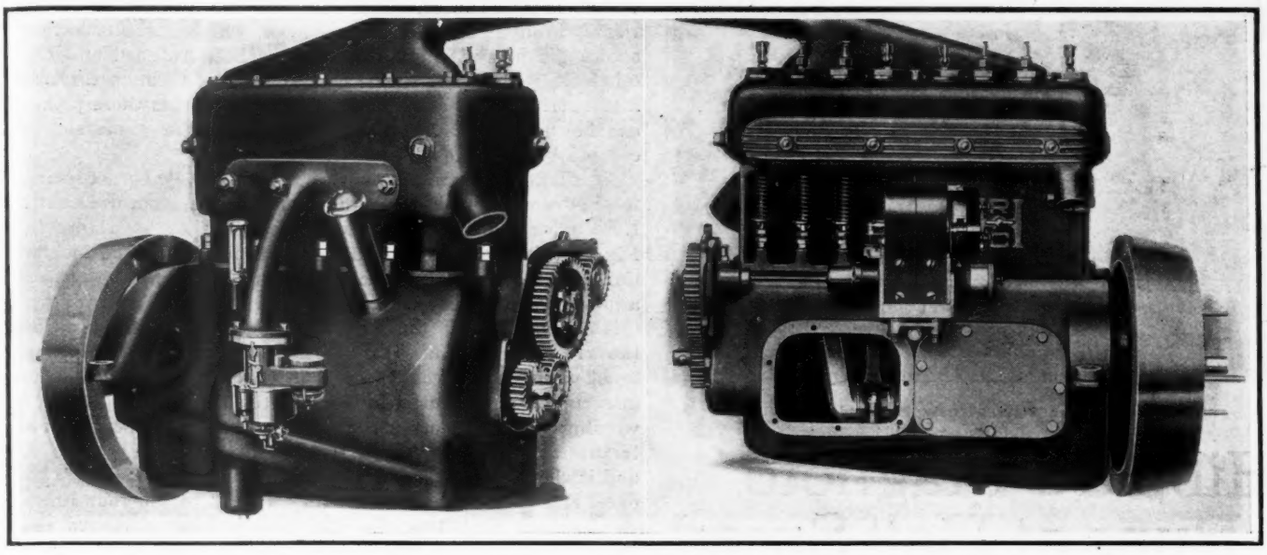


Fig. 1—Both sides of the R. C. H. motor which has been retained for use in the new line of R. C. H. cars

New R. C. H. Has Streamline Body

Keeps Same Motor But Replaces Dry Plate by Cone Clutch—Body Work Is Greatly Improved

THE revamped R. C. H. Corp., of Detroit, has brought out a car which is radically different in appearance from the one which previously bore the same name. The new R. C. H., which is illustrated on this page, is an up-to-date proposition involving the sloping hood and modified streamline body which has come to be recognized as exemplifying the latest in automobile design. The power plant and running gear do not differ materially from the R. C. H. construction of previous years, but is modified to meet the needs of the more roomy and more prepossessing body of the present car.

Referring to Fig. 1, both sides of the motor are shown. It has block cylinders with bolted-on exhaust, giving a simple exterior. The motor is 3.25 by 5 inches, with a compact arrangement of cylinders due to the method of casting in block and by the use of a two-bearing crankshaft.

Four Rings on Each Piston

One of the features of the R. C. H. is the use of four piston rings on each piston. This gives a steady guide action and takes up the thrust from the 9-inch connecting-rods. The crankshaft is 1.875 inches in diameter and carries the same diameter at each of the crankshaft bearings. The motor is suspended from the chassis at three points, one support being at either side of the crankcase at front and one at the center in the rear.

The valve action is accessible by removing the cover plates as on the right side of Fig. 1. The diameter of the valve is 1.125 inches and the lift .25-inch. The order of timing is 1-2-4-3. Adjustments on the valve tappets are made by means of hexagonal nuts on the bottom of the push rods.

As the views of the motor readily disclose, the cooling system is a thermo-syphon. The motor is oiled by means of splash, the oil being conveyed from the reservoir in the base.

The fuel feed is by gravity to a specially designed B-D carbureter mounted on the intake manifold as illustrated on the left, Fig. 1. It is shown between the oil filler opening and the oil level gauge on the crankcase. Ignition is by Bosch high-tension magneto.

The clutch is a leather-faced cone type with the leather held in place by drop-forged T-bolts. The old R. C. H. had a dry plate clutch. The engagement springs which are provided under the facing allow a smooth start and the main clutch springs are three in number, each provided with an adjustment feature for regulating the tension. The clutch throw out is a long drop-forged yoke operated in connection with ball thrust bearings. In order to facilitate easy gear changes, the clutch is provided with a brake which checks the spinning action when de-clutched. The clutch hub sleeve is adjustable, allowing for changes between that and the universal joint.

Power is delivered through a three-speed selective gearset geared direct on third and provided on direct drive a reduction of 4.25 to 1 through the rear axle. The reduction on second speed is 8.5 to 1 and on first speed is 13.8 to 1.

The brakes are 10 inches in diameter and have a 2.25-inch facing. They act directly on a drum bolted to the rear wheels. The wheels are 32 inches in diameter carrying 3.5-inch tires and are fitted with demountable rims.

The body work and equipment are a step in advance over previous R. C. H. cars, the 110-inch wheelbase and the general low-hung appearance of the car giving graceful lines which are more typical of American design than the previous R. C. H. which strongly favored foreign light cars in appearance. The car is sold fully equipped for $900.

Fig. 2—New touring car lines adopted by the R. C. H.

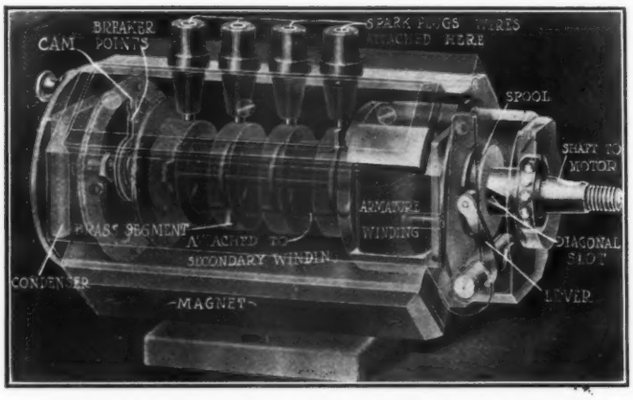


Fig. 1—Phantom view of new Hibbard magneto

Hibbard Magneto Runs at Half Speed

High-Tension Machine with Two Armatures—Bar Magnets Instead of Horseshoe Fields

A RADICALLY different type of magneto has just been announced by the Grip Nut Mfg. Co., Chicago. It is known as the Hibbard and operates at one-half the speed of the ordinary instrument, has two armature windings each containing its own primary and secondary, has four bar magnets instead of horseshoe fields and almost any degree of advance or retard may be obtained by shifting the armature instead of the field or the breaker box as is generally done. The distributer is inside the magneto and the entire distributer board revolves.

It is stated by the maker that the quick shifting of the armature shaft, which is accomplished from the seat, is sufficient to generate enough current provided the breaker points are in the proper position, to give an intense spark at the plugs. Under these conditions no battery would be needed in starting. An unusual form of breaker mechanism is used. In the Hibbard, the cams are stationary and the breaker points revolve and separate only when they strike a cam. The condenser is carried in a cover at the end of the magneto and connected to the circuit by a plunger.

The armature shaft, mounted upon ball bearings, has attached at one end two armatures as shown in Fig. 2, each armature having its own primary and secondary winding and both feeding to the distributer.

The bar magnets are four in number, are free at one end and are connected by a heel plate at the other so that the instrument really incorporates two horseshoe magnets and thus two separate fields. The breaker mechanism carried at the end opposite that of the windings consists of four stationary cams, for the four cylinder type, these cams being made of fiber. Each point of the interrupter is carried on a separate strip of metal and the two held together by spring pressure. As the strips pass the cam they are spread apart and thus the primary circuit is interrupted. The detail of the breaker construction is brought out clearly in Fig. 4, where one illustration shows the points before the cam has been reached and the other the points just as the cam is passing through the two metal strips. The condenser is connected across these points as shown in Fig. 2, the cover in which the condenser is carried being removable.

In order to explain the current paths it will be necessary to show the construction in the center of the armature shaft. Here a long rivet runs the length of the shaft as shown in Fig. 2, this rivet being insulated and outside of the insulation, a tube is carried. The rotation of the armature causes a low-tension current to be generated in the primary winding, this current leaving the winding and passing to the head of the rivet as shown. It passes through the rivet to the breaker points and condenser as in the usual construction, is interrupted and returns by way of the tube to the primary winding thus completing the circuit. At the moment of interruption a high-tension current is induced in the secondary, and it should be remembered both windings are operating at once, and this passes to the lead attached to the four brass rings which constitute the distributer system. Above the Bakelite segment retainers are four distributer terminals which have steel brushes pressing against the segment retainers. As the segments pass these brushes the current is sent to the spark plugs where it is grounded.

Spark Advance by Spiral Slot

The shifting of the armature is obtained in a simple way by the slot method. The shaft coupled to the motor has a straight slot cut as shown in Fig. 3. This portion fits into a sleeve part of the armature shaft, with a diagonal slot. Around the sleeve is a spool the bottom of which contains a pin which runs through both slots. The spool may be carried back and forth by the lever on the steering wheel. Any spool movement causes the sleeve to turn because the slot is diagonal and hence it carries the armature shaft with it.

The Hibbard magneto weighs no more than the ordinary type but as will be noted is considerably longer than it is high. This is an advantageous construction for if placed on the valve side of the motor it does not interfere with valve adjustments being made. The results of the tests, made by Prof. Gebhardt, at Armour Institute showed, according to report issued that there is less wear on the parts due to the fact that the instrument operates at 1-2 the speed of the ordinary magneto, this being true because of the four-pole construction. In order to maintain this feature in a six-cylinder magneto it will be necessary to use six magnets. The ease of parts replacement is a decided feature of the Hibbard. A very small condenser capacity is used for the reason that a quick primary break is made which also gives a high secondary voltage, and consequently a spark of high heat value at the plugs.

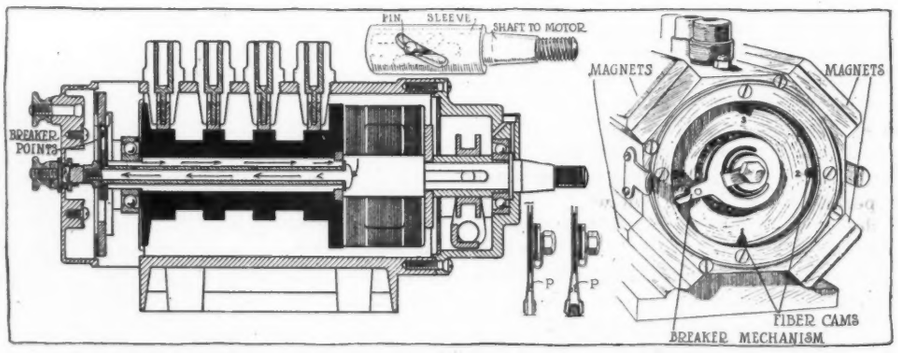


Fig. 2—Left—Section through Hibbard magneto. Fig. 3—Center, top—Spiral sleeve for advancing spark. Fig. 4—Center, bottom—Detail of breaker point separation. Fig. 5—Right—Breaker mechanism

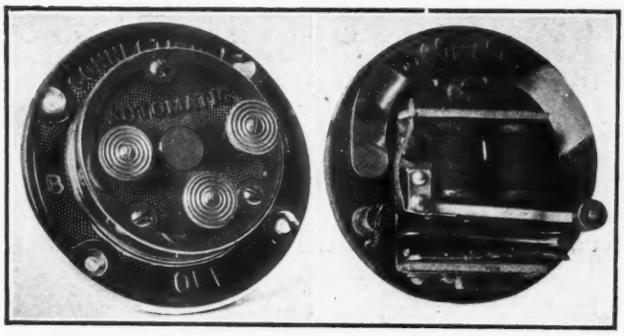


Fig. 3—Left—Switch with three buttons. Fig. 4—Right—Vibrator which cuts off current when driver forgets to do it

No Spark Lag in New Connecticut

System Includes Combined Timer and Distributer and Step Coil with Automatic Cut Out

AFTER 2 years of preliminary work, which included road testing on a large scale in both summer and winter weather, the Connecticut Telephone & Electric Co., Meriden, Conn., has placed on the market an ignition system of the battery type which includes a combined timer and distributer and a step-up coil with an automatic switch which cuts off the current in case the car should stop with the circuit closed, and thus prevents the exhaustion of the battery.

Briefly, the advantages claimed for the system are that it delivers a large, hot spark which ignites a comparatively large amount of gas and so makes the propagation of flame very rapid; that there is no discoverable lag in the system at any speed; that it is of extreme simplicity in its construction and in its requirements in the way of attention, and can easily be taken apart and assembled without tools and without disturbing the timing; that the intensity of the spark increases as the speed decreases, though the spark is much more than ordinarily intense at high speeds; and that the apparatus is as nearly foolproof as it can be made.

The timer, Fig. 1, is built somewhat on magneto lines, as the accompanying pictures show clearly. The shaft has four equally spaced longitudinal ribs, R, which act as lifters for the breaker lever L which is in the form of a semi-circle pivoted at one end and carrying one of the platinum points P at the other; at the center is a hardened steel roller upon which the shaft ribs act to move the lever, separate the platinum points and interrupt the primary current.

A disk or cover of metal fits over the timer, carrying at its center a bearing for the extended shaft; a dowel in the timer case, entering a hole in the cover, makes it impossible to put the cover on wrong. A mica window over the points permits of viewing them while running. The cover is held down by a split-pin above the cover.

The distributer, Fig. 2, consists of a central cylinder of insulating material carried at the top of the shaft, which is cut away where it enters the rotor and fits into a hole of corresponding shape, thus forming a drive and at the same time absolutely preventing wrong assembling. The rotor carries in its periphery the radial carbon distributing brush, which is pressed outward by a light spring in a recess in the rotor. A light flat steel spring on the top of the rotor carries the secondary current to the distributer arm from the coil.

The distributer housing, H, of the same insulating material as the rotor, carries embedded in its inner walls the four contacts connected to the four terminals at the top, outside. These terminals may be either vertical or horizontal, and for any size of high-tension cable, these details being specified when ordering.

A feature of the type J instrument is that it requires no lubrication of any kind. The bottom bearing for the shaft and the bearing in the timer cover are of a substance formed by mixing graphite and babbitt when the metal is in a molten state and subjecting the mixture to an air pressure of enormous intensity. Bushings of this compound run without oil.

Ingenious Switch Used

The switch, Fig. 3, is peculiarly ingenious. It has three buttons: one is for the battery, one for the magneto, in case a dual system is used, or for two separate batteries, and the third is a releasing button, throwing out any button that is pushed in and cutting off the current.

The plungers on which the buttons are mounted work through holes in a plate inside the cover plate; the perforated plate is pivoted and a spring keeps it normally pressed in one direction. When a switch button is pressed the conically-shaped end of its plunger slightly swings the plate, which then snaps into a notch under the cone, holding the button down and keeping the circuit closed. When the releasing button is pressed its cone pushes the plate around far enough to slip out of the notch in the switch button that has been engaged, letting it fly up.

Mounted on the swinging plate there is a sliding bar, the ends of which reach the cones of the button plungers. The plate is of such length that when one button is pressed, the cone pushes it out of the way—that is, toward the cone of the opposite button—and the plunger can be depressed all the way. If, however, both are pressed at once, both are blocked by the sliding plate, which is too long to allow both to go down together.

The automatic kick-off, Fig. 4, which throws out the switch, in case the driver forgets to do it, consists of a vibrator of the electric ball type, the hammer of which strikes the edge of the swiveled plate referred to in the description of the switch, and drives it out of the plunger notch. The current to start the vibrator is switched on by a thermostat, which, heating under the continuous and abnormal flow of current, swings over and establishes contact. Once the vibrator starts the switch is released in a fraction of a second cutting off all current, when the thermostat quickly cools and returns to normal position.

The time required for the thermostat to act may be controlled by a regulating screw. Ordinarily, it is set so that if the timer is short-circuited when the driver closes the switch to start the engine, there will be time for him to get around to the crank before the switch will be thrown out—about 30 seconds.

Fig. 1—Left—Timer, showing breaker details. Fig. 2—Right—Distributer with brush removed

The Automobile

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Better Industrial Relations

IF anyone doubted the value of the movement toward better industrial relations between the employer and the employee, this doubt would have been removed by a visit to the exhibit of better industrial relations given by the Business Men's Group of the Society for Ethical Culture in New York City, during the past week.

This type of uplift work is as different from that given under the title of charity as day from night. It is not only profitable to the worker but to an even greater extent to the employer of labor. Lesson after lesson could not fail to have been driven home in the mind of the visitor in studying the charts which presented the graphic arguments in favor of the study and adoption of a scheme in which the employer and employee are brought to work hand-in-hand.

Results, as plotted in curves showing increased profits on one hand and increased pay to the laborer on the other, were to be seen by the score. Owing to the introduction of a bonus system of payment, for instance, the wages of the workers in one factory were increased on an average of 15 per cent. and at the same time the output of the company and, hence its proportional profits to the extent of 9 per cent. But this does not represent all the profit to the company. The psychological effect of a band of satisfied and contented laborers upholding the policy and good name of their employers far exceeds in value the 9 per cent. increase in production.

Reviving Small Fours

THE year 1915 will not be so much noted for sixes as was predicted by not a few makers several months ago. In a canvass of over 25 per cent. of the makers it has been discovered that scarcely a company at present building a four-cylinder model in addition to its six-cylinder program, is going to drop the four for next season. Last year as announcements came out, the story was one of new sixes and dropping fours. Present indications are that there will be many fewer such announcements during the coming fall.

In addition to carrying over many of the present four-cylinder models there are several companies which are bringing out small four-cylinder motors that will list around the $1,500 mark. These new fours give promise of being the most interesting announcements for the coming season. What the outcome of such models will be is highly problematic in view of the six-cylinders now on the market listing at slightly over $1,700 or thereabouts. With four-cylinder models at somewhat lower prices, there is promise of a real duel between the four and the six in this price zone next season.

Such a duel will have considerable interest because the sixes selling in this field are supposed to be the last word in efficient motor manufacture in America and the new high-efficiency fours which are at present undergoing test are naturally equally up to the minute. In these new models we will then have fours and sixes battling on almost even terms so far as engineering is concerned. The question to be solved will be, which will give the best satisfaction? With many it is not yet a settled question whether a really permanent and satisfactory six can be produced at $1,700 or lower, although there are several makers on the market at present listing close to this figure and if they prove a permanent success, as they at present indicate, then the answer will be at hand.

The present fact that several concerns are bringing out small four-cylinder cars for next season must not be interpreted as meaning a decline of the sixes, but rather a further stage in the solution of the problem as to which will be the eventual, the four or the six. Makers are divided on the answer. One maker asserts that when listing a car at over $2,000, the six has the lead, yet another maker listing at over $3,000 finds a steady market for his four-cylinder car, claiming that his buyers are entirely satisfied, and prefer the four to the six.

No definite trend can at present be outlined that would apply to all in that production is the determining factor with one maker, whereas with another limited output with higher price and coupled with more individual options are determining factors. Individuality is bound to be more and more apparent in cars listing at over $2,000. The entire country has not yet been sold to sixes, there has been a slight reaction set up for the fours, but as to the eventual the answer will be partly found in the performance of the present small sixes as compared with the new small fours coming out during the present fall.

Recommends a Trucking Trust

Railroad Man Tells E. V. A. A. That Inefficiency of Terminal Arrangements Is Due to Lack of Organization of Street Vehicles

NEW YORK CITY, April 25—At the monthly meeting of the Electric Vehicle Association of America, held at the Engineering Society Building last night, a large increase in the membership of the society was prophesied, the secretary predicting that by October, when the next convention is held, this association will number 1,000. Last year only two sections, those of New York and Chicago, existed. Now sections are organized in New England, Chicago, Philadelphia, Washington, Cincinnati and San Francisco.

The paper of the evening was The Problem of Terminal Freight Congestion and Its Solution, by Fred A. Hortter, car accountant of the Boston & Maine Railroad. Mr. Hortter pointed out that the problems confronting merchant and teamster are also felt by the railroad company. He dilated upon the inefficiency attendant upon the operation of street traffic vehicles to and from the freight terminals, and suggested that systematization of this traffic in a manner similar to railroad organization would greatly improve conditions. Mr. Hortter's solution of the difficulty was the combination of the teaming interests into a sort of teamsters' trust. Mr. Hortter said, in part:

"The latest available Interstate Commerce Commission report on railroad freight service, covering the year ending June 30, 1911, showed a freight equipment of slightly over 2,195,000 cars, and a freight movement of nearly 254,000,000,000 ton miles.

"Observation of the terminal yard in the B. & M. R. R. yards in Boston showed that in 1 day 10,264 horse-drawn vehicles handled freight to the outbound freight houses. The total outward tonnage for the week amounted to but 22,416 tons, which showed an average horse-vehicle load of only 36-100 of a ton each. Calculate for yourselves the efficiency of a 5-ton unit operating under this load factor.

"In another observation in a trucking concern hauling approximately 180,000 tons of merchandise annually, the ratio of loaded and empty mileage of the horse vehicles was found to be 241:143, while the actual moving time represented but 22.95 per cent. of the total day's work.

"* * * $9,379,524 of the gross income of the railroads of the country in 1911 consisted of penalties received for the detention of freight beyond the free time limit. Do not misconstrue this as being a desirable source of income to the railroads, because such is not the case. Every dollar collected for demurrage carries with it a loss of $2.35 in the earning capacity of the cars held beyond the free time limit. Calculated on the basis of the demurrage receipts for the year ending June 30, 1911, the loss to the railroads in the earning capacity of their freight equipment amounted to more than $10,482,700, above all revenues from demurrage.

Demurrage Is Increasing

"The most serious aspect of the whole situation is the fact that the average car detention is constantly increasing. This is evidenced by the reports for New England for the years 1911, 1912 and 1913, which show an average car detention for these years of 1.58 days per car, 1.63 days per car, and 1.66 days per car respectively.

"During all of this period the National Code of Demurrage Rules was in effect. To be sure the increase is very slight, being but 8-100 of a day per car, but it assumes considerable proportion when based upon the three million cars included in the figures from which this average was compiled. Expressed concretely, it amounts in the aggregate to 240,000 car days; or, expressed in terms of cars, the railroads of New England have been called upon to increase their equipment by 800 cars within three years at a cost of nearly $1,000,000 merely because of the inefficient system under which the freight is handled beyond the railroad's terminal.

"The remedy is apparent. It lies in the co-ordination of the railroad and highway movement of merchandise, and a collaboration of the railroads and the teaming interests.

"This would prevent the use of a 5-ton truck for carrying a small lot of freight weighing only a few hundred pounds one or two miles across the city, by arranging to have that truck move via a definite schedule to its destination, picking up en route sufficient other parcels of freight to utilize to the fullest extent the carrying capacity of the vehicle.

"Furthermore, an organization of this kind could probably establish central clearing stations at convenient points in the business districts to which light capacity vehicles could be run from nearby warehouses and from which consolidated loads could be moved in high capacity trucks to the railroad and steamship terminals, bringing back on their return similar heavy loads of inward freight for redistribution from the central station."

Discussion by Many Experts

Hayden Eames, a traffic expert of considerable renown, pointed out that the plan recommended by Mr. Hortter had been carried out in substance by the Harriman lines several years ago. Taking but one step farther, this company established in St. Louis, Mo., and Los Angeles, Cal., a system of complete delivery of freight in the same manner as deliveries are made by the express companies, in vehicles owned and operated on schedule by the railroad. Mr. Eames stated that the plan was abandoned for no apparent good reason.

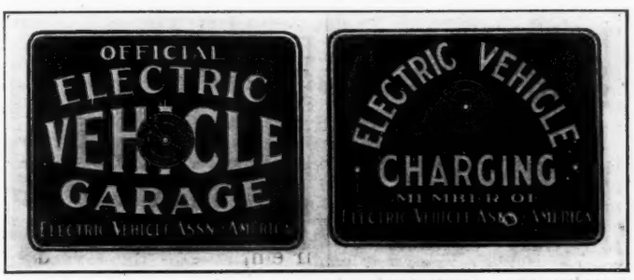
W. P. Kennedy discoursed extensively on the subject to show that no one of the four classes interested—the railroads, the teamsters, the merchants or the manufacturers and dealers in efficient mechanical equipment—could bring about the improvements of the physical conditions that seem imperative at the present time, but that some method must be devised whereby all of these interests can be brought to work together.

It was also stated that, in the opinion of a listener, it was not up to the teamsters to organize a combination or trust for the efficient transport of goods over the streets in order to enable the railroads to avoid improving the terminal facilities, nor was such a propaganda possible under existing conditions of keen competition and the impossibility of getting an exclusive franchise over the streets; but that it was up to the railroads to so improve the conditions on their own premises that the shippers will be able to operate modern equipment economically.

C. L. Shirly, of Boston, stated that at the factory in which he is interested, near Boston, a new plan of shipment has been adopted whereby the firm has been able to get much better service from the railroad than in the usual method and to diminish the idle time of the vehicles considerably. Instead of sending each shipment of goods to the freight terminal as soon as it is made ready, regardless of its destination, route, or size; under the new method, everything is held until night, at which time all of the shipments are assembled according to the routes they are to take, and trucked to the freight houses at night, when the streets are clear and there is the least congestion at the terminals. A car is left waiting at 7 o'clock each morning, so that it is loaded in the minimum of time. He stated that he considered this systematic shipment on schedule of far greater importance than the equipment of either shipper or carrier.

George Bartlett, of Philadelphia, pointed out that it was often impossible to follow such a plan as outlined by Mr. Shirley, and that the method of shipment must vary with the class of work done. He called attention to the fact that electric trucks, both of the street type and industrial type, were used successfully by the Pennsylvania Railroad in Philadelphia and that such a scheme as described by Mr. Eames had been in successful operation in Baltimore; but, although all concerned were well pleased with it, it has been discontinued owing to the ruling of the Interstate Commerce Commission that a separate charge must be made for street haulage. In reply to questions by Mr. Bartlett, Mr. Hortter stated that the average haul for l.c.l. shipments, the country over was from 242 to 254 miles, according to the section of the country, and that it cost the Boston & Maine, at its Boston terminal, 29 cents per ton of freight handled over its platforms.

Day Baker, of Boston, pointed out that the New York, New Haven & Hartford Railroad is using two electric trucks of 5 tons capacity with great success in the transfer of freight from different terminals. He stated that formerly this work was handled by thirty-seven freight cars, switched by yard locomotives, and that the new method effected a saving of over $35 per day.



Official garage and charging-station signs of the Electric Vehicle Association of America

Over-Time Common in Indianapolis

Cars from $2,000 Up Sell Well—Reports That Long Northwestern Winter Causes Selling Rush at This Season—Optimism General

INDIANAPOLIS, IND., April 25—This city has ten concerns engaged in the manufacture of gasoline passenger cars, one in the production of electrics, and several in the manufacture of cyclecars, gasoline trucks and various kinds of accessories. In a 2-day circuit of the various makers of gasoline cars, your representative has found all of the Indianapolis factories with two or three exceptions working at full capacity and some of them operating night shifts in several of the factory departments, and while Indianapolis cannot be compared with Detroit when its total production for the year is considered, it cannot be denied that a majority of the companies are in particularly strong condition and the reports of financial depression have had little effect on them.

During the past autumn nearly one-half of the Indianapolis companies experienced some slight setback, due to overproduction, and temporary lack of finances to meet such exigencies. These matters were all nearly settled by the opening of the year and the factories since have been on a capacity schedule.

Cars Over $2,000 Sell Well

Indianapolis has many factories marketing the product above $2,000, a field in which it might be expected that the business depression of the present year would work particular havoc. This has not been the case, in fact the companies in this field report particularly good conditions and business in excess of a year ago. This is explained by the fact that the manufacturers of cars marketing over $2,000 are able to build up a clientele of buyers that does not change, and although reports have been current of supposedly difficult business selling cars in this price, these conditions do not seem to have made themselves felt in the Hoosier capital.

There has been a general increase in the selling zone in cars listing at $2,000 or over. This is explained by the fact that in many cities of 20,000 or under the social leaders have begun buying higher-priced cars in order to maintain a so-called social status. Years ago the cheap car maintained this social standing, but nowadays with the cheap car selling in such enormous quantities, the social leader must look to other prices to maintain the status.

Judging from the general sentiment of Indianapolis makers next year will not be all sixes. There is a general idea that all four-cylinder models will be continued and one or two companies are planning to build smaller fours and revive previous four-cylinder models.

National Co. Spreads Sale Zone

January, February and March were 10 per cent. ahead of a year ago with the National company, according to George Dickson, general manager. This may partly be accounted for by the fact that the selling zone has been increased approximately 50 per cent. during the year and the concern has entered more vigorously into the closed car business which is now a 10 per cent. factor in its output.

The National company as an example of a general distributor and with its four-cylinder car at $3,300 and its small six at $2,375, can be taken as a good criterion as to how business conditions are throughout the country. The company reports New England ahead of last year, as are also such sections as the Pacific coast, Middle West, and great Southwest. The East, including New York City, is normal with last year, but has not shown the increases met with in other sections. The South has shown decided improvement.

The National company started deliveries on its 1914 cars December 1, and expects to finish June 15. The factory has been at full capacity all the time and four or five departments have been working on a night shift until 10 or 11 o'clock. The company has experienced such success with its four-cylinder car this year that it will be continued next season. This company is completing four of the most successful years in its history.

The Lyons-Atlas Co., which began the delivery of the Lyons-Atlas with its Knight-type motor on August 30, has confined its selling campaign to approximately a dozen centers, such as New York, Chicago, Boston, Philadelphia, Providence, Rochester, Atlanta, St. Louis, Nashville, San Antonio and Seattle, and reports business generally good from all of these sections, particularly the East, which is in a much better condition that the Pacific coast, where they report considerable price cutting, too much selling on long terms, and too expensive selling methods.

This company builds four-cylinder cars only and Sales Manager E. H. Chase says that the demand for sixes has been very slight, but is stronger in the west than in the east. The company will continue four-cylinder cars next year and looks for such states as Nebraska, Kansas and Oklahoma as big-buying centers for medium-priced cars next year.

Pathfinder to Drop "Four"?

W. C. Teasdale, president of the Motor Car Mfg. Co., makers of the Pathfinder, reports that his company has at present sufficient orders on hand to keep the factory busy until June 15. This company has held aloof from the price vortex of this season and lists one six-cylinder model at $2,750, another at $2,222 and a four-cylinder at $2,185, the company's policy being to maintain a price zone of its own and give individual options at this figure. Seven-eighths of this year's output will be sixes and the company may abandon its four-cylinder model.

This year's business has been particularly satisfactory, the sales for the first quarter being 30 per cent. ahead of a year ago. The state of Indiana has been a particularly good selling field; the Pacific coast is taking 30 per cent. of the output, and business has been good in New England and also west of the Mississippi.

The company started January 1 and in addition to keeping its factory at capacity throughout the week has also worked Saturday afternoons, every night, and on Sundays.

Social Ambition Sells Marmons

Marmon has sold more cars during the first 3 months of this year than in the corresponding months of a year ago, and looks forward to particularly good buying conditions during the coming fall. One notable change that Howard Marmon has observed is that the sale of large cars, such as the Marmon six, listing at $5,000, is spreading into smaller cities more this year than ever before. This is largely due to certain classes in these cities feeling obligated, perhaps by social conditions, to use larger cars than are general in places of small population.

H. H. Rice, sales manager, who has just completed a trip through the south, reports conditions in Fort Worth, Tex., as particularly good, the cattle ranchers making their headquarters there being good buyers. Business in Galveston is good, but Dallas poor. New Orleans is particularly quiet, due to poor road conditions. Atlanta and Chattanooga are specially brisk markets at present. Memphis and Birmingham are fair. Conditions are good in Houston, Tex., for cheap cars.

Empire Business Grows 300 Per Cent.

The Empire company, which expects to complete its output of 3,500 cars for 1914 by July 1, places its January, February and March business at nearly three times the amount of a year ago. The great Mississippi valley, extending from Chicago west and embracing Kansas, Missouri, Minnesota, Nebraska, Iowa, Wisconsin, Illinois and Indiana, is the great buying area for these cars. Analyzing this buying territory still further, the company reports Texas as greatly improved, due to better cotton conditions, but the southern or Gulf business relatively slow.

The Empire company has built up an enviable export trade and is at present shipping cars to sixty different countries. It has built up an export department of its own in preference to working through American exporters, claiming by its own department to give better prices to the foreign buyer.

With a car, such as the Empire, listing at $900 as either

touring car or runabout, and selling largely to agricultural classes, there is a gradual shortening of the selling season, particularly in states such as Minnesota and the Dakotas, where the winters are long and the touring season proportionately short. This congests deliveries into April and May, which are the big months of the year, and naturally calls for storing of cars in advance in order to make necessary deliveries at these times.

Although selling largely to the agricultural territory, two-thirds of the cars are shipped with complete electric lighting and starting outfit at an additional expense of $125. Its standard car without electric equipment sells best in the northwestern sections.

L. R. Wilbur, assistant general manager, states that the company is at present manufacturing twenty per day and expects to be manufacturing twenty-five very soon. From February to August is the busy season for this company.

Stutz Builds 767 of the 1914 Cars

Harry C. Stutz, president and chief engineer of the Stutz company, mentioned that his company has completed 767 of its 1914 cars to date and that the factory has been running steadily since the opening of the season, never making fewer than three cars a day and now operating at four, which is its capacity. Ground has been broken for the new factory, which will greatly increase its output.

The Stutz company, which made its debut in the Indianapolis race three years ago, might be expected to market largely runabout or speedster cars, but to date this year one-half of its output has been standard touring cars, one-quarter roadsters, and the remaining quarter the "Bearcat" roadster type, the last model selling chiefly in such cities as Chicago, New York, Boston, Buffalo and Los Angeles. The company distributes its product in twenty-five or thirty of the largest cities.

In speaking of the present business condition, Mr. Stutz places the first quarter of this year approximately the same as last year, and reports big gains in New England territory, but with business dull on the Pacific coast. The company has operated its factory at capacity all winter, not laying off a single workman.

So far as the relative demand for four-cylinder and six-cylinder models is concerned, the Stutz company places it 10 to 1 in favor of the four, and consequently expects to feature its fours for next season as well as continuing its sixes. The company expects to stay in racing as it has in the past. The new Stutz factory will be a four-story building, 80 by 210 feet.

The Henderson company, through its president, R. P. Henderson, has found Minneapolis and Omaha good selling centers, although the long winters and short touring seasons congest deliveries into a relatively short period. This company, which has previously made a policy of announcing its new models a week previous to the Indianapolis race, does not expect to make its 1915 announcement until on or about July 1. The 1915 Henderson models are undergoing road tests.

March was the biggest month in the history of the Wheeler & Schebler Carbureter company, the shipments amounting to 2,600 carbureters, which figure is expected to be eclipsed when the April report is compiled. The concern is turning out 1,000 a day at present.

In reviewing the business situation for the last 6 months, Sales Manager George T. Briggs points to a quiet zone in business which set in late in July and continued through August and September. A revival set in in October and November, but dullness returned throughout December. With the opening of January an avalanche of business ensued which has continued until the present. Since the opening of the year the factory has been working full time and the foundry and screw machine departments at night.

As the Wheeler & Schebler company sells a goodly percentage of its carbureters through its dealers, the company naturally is in close touch with business conditions throughout the different sections, and in its analysis reports business particularly good in New England and New York, as well as in such centers as Minneapolis and the central west. The Pacific coast is in good shape.

Overtime at Premier Plant

The Premier company is at present turning out from 6½ to 7 cars per day and by May 1 hopes to be considerably above this figure. At present its output is one-half the new Weidely motor and the remainder the T-head type. Both of these motors are being used in the same chassis. George Weidely, chief engineer, speaking for his company, is convinced that for cars listing over $2,000 the six-cylinder has the call, their models carrying prices of $2,385 for the T-head and $2,700 for the Weidely, both being sixes. The Premier company has been building sixes for 8 years and is more strongly convinced than ever of the six's superiority in this price field.

The factory is at present operating at full force and in addition many of its machines are operating until 10 P. M. and some departments working all night. The final assembly has been working until 9 P. M. for the last month, and the company is at present completing plans to work night and day shifts on the manufacture of the new Weidley motor.

The Premier company sells its cars in from forty to fifty-four cities and reports a considerable increase in business in cities such as Charleston, W. Va.; Norfolk, Albany, etc. Business is reported as good not only in New England and the Pacific coast, but in many other cities, such as Atlanta, St. Louis, etc.

J. J. Cole, president of the Cole company, has completed the new factory, which is a four-story concrete construction, 100 feet frontage and 400 feet depth. The general offices, including the engineering department, will be located in the front of the building. At present a part of the body-finishing department is installed in this new plant, which has been completed approximately 2 months.

The Marion company is at present operating a force of 400 men and turning out touring cars and runabouts, the former in larger quantities than the latter. These cars are distributed through a country-wide selling organization and the demand in the middle west is greatest.

March Breaks Record—60,000 Cars Shipped

NEW YORK CITY, April 23—March was a record month for the shipment of automobiles in this country, and April will exceed any similar month of past years, according to the figures brought by Alfred Reeves, who has just returned to New York after visiting forty-one automobile plants in Ohio, Michigan, Indiana and New York, in connection with his work as General Manager of the National Automobile Chamber of Commerce, the trade organization which includes ninety-one factories in its membership.

The figures supplied by Mr. Reeves are taken from the records of the N. A. C. C. Freight and Traffic Office maintained at Detroit. These figures show that during the month of March, shipments in the Western district were more than 60,000 cars, for which 13,510 freight cars were required, which is the largest single month of which the industry has any record.

"Our Western traffic bureau," said Mr. Reeves, "shows 13,510 freight cars used during March, with a demand for 14,000 freight cars during April. If automobile freight cars alone were used, there would certainly have been a shortage, but Ford and a number of other manufacturers are able to utilize 36-foot cars, which has avoided a car shortage such as the West experienced during the previous winter.

"My trip showed a number of interesting things that not alone prove the prosperity of the business, but also its conservatism. The companies are apparently all in excellent condition, and while manufacturing conservatively during the winter, they are now traveling at speed and far behind the demand. We know the present manufacturing pace cannot be maintained the year round, with few exceptions, but the figures prove that the dealers, who because of their knowledge of local conditions are the best barometers of trade, feel optimistic and confident of their ability to market a large number of motor cars during the spring season.

"With the makers going along in conservative fashion, they are receiving liberal support from financial interests. Moreover, a number of the factories that were over-extended last year are doing an excellent business this season and fast reaching a solid basis.

High-Priced Cars Also in Demand

"Another favorable feature is the fact that, while the extraordinary demand for moderate priced cars continues, some of the factories being almost sold out of 1914 models, there is a sustained and increasing demand for the higher priced machines, one example in Detroit being the record-breaking quarter of one of the biggest manufacturers of high priced cars, that is enjoying the heaviest demand for its product in the history of the company.

"In Detroit now there are 114 factories producing automobiles or automobile parts, of which thirty-five are making passenger cars or trucks complete. Outside of Detroit there are scores of other plants, from which you can judge the importance of the automobile industry to Michigan and its people.

"Not alone is the demand this spring an excellent one for gasoline cars, but the electrics are sharing to a marked degree in the sales."

Direct Representation Needed in Russian Trade

Manufacturers Learn of Methods for Exploiting Trade—Czar's Empire Now in Prosperous Condition

NEW YORK CITY, April 23—The conditions governing the exportation of American automobiles to Russia was the subject considered at the joint meeting of the Russian trade division of the National Association of Manufacturers with the commercial attaches of the Russian Imperial Embassy at Washington. This is the second of a series of open meetings to be held at the offices of the society at 30 Church street to further commercial relations with Russia. Several men prominent in the automobile industry were present.

The important question before the meeting was why the United States, the greatest producer of automobiles, should have an almost negligible percentage of the Russian trade and to consider means for increasing this trade.

This meeting is particularly opportune because Russia is now passing through the most prosperous period it has ever enjoyed. All its factories are running to their capacity and a great many of them are as much as 6 months behind in their orders. In fact, in some cases, the inability of the home concerns to cope with the flood of business has resulted in the temporary removal of duty on certain articles until normal conditions are again reached.

It was agreed that American automobiles are capable of giving satisfactory service in comparison with European machines, although for the poorly paved streets and rough roads of Russia the American machine is light and undertired. Machines with larger tires would be more suitable, although difficulty with tires is not so frequent now as a few years ago.

As has been found true in all foreign countries, the only satisfactory way to introduce a car in Russia, is to send a factory representative over to first study the conditions carefully and then let the company open a headquarters and establish sub-agencies with dealers throughout the country. Less preferable would be the assignment of the whole territory to one man who would have the power to make sub-agents.

Practically the only American manufacturers that are doing a profitable business in Europe are those that have established branches. It has been demonstrated time and again that where an individual takes the agency for a car and then makes a success of it the factory assumes control of the agency and the dealer has his business taken away from him just when it becomes profitable.

It was urged that the feature of prompt and efficient service is most important and has more to do with a car's success than anything else. If the service is good the owner will be satisfied with his car.

As matters now stand one of the greatest difficulties in the way of introducing a car in Russia, or anywhere else in Europe for that matter, is the fact that the first car must be bought by the dealer before he sees it. American makers require that the car be paid for before it leaves New York. This means that the dealer must buy the car from a catalogue. There is a large field for American machines in Russia, but it is impossible to expect cars to be bought without being seen.

Whether a factory branch is established or the sale of the cars given to an individual it will be found hard to dispose of the cars to the sub-agents because of the liberal credit allowed by the European firms. In this regard Germany is the most formidable, allowing from 6 months to 1 year. Considering that American firms as a rule do business on a strictly cash basis, it is difficult to see how this objection can be overcome.

Those in attendance included: T. S. Locklin, Jr., Gerhard & Hey, New York City; H. M. Salisbury, General Motors Export Co., New York City; W. A. Schuler, Tesco Equipment Co., New York City; W. McRone Milner, United States Vice-Consul, Calais, France; W. R. Vogeler, King Motor Car Co., Detroit, Mich.; J. J. McGowan; E. W. Davenport, Maxwell Motor Co., Detroit, Mich.; Jay Rathbun, the White Co., Cleveland, O.; Andrew W. Ferris, J. A. Fay & Engineering Co.

To Form National Association of Garage Men

BLOOMINGTON, ILL., April 27—At a meeting of the Garage Owners' Assn. of Illinois, recently held in this city, preliminary steps for the formation of a national association of garage men were taken. It is proposed to gather all the various state associations into a national body which will work nationally for the betterment of the trade. There are said to be about fifteen states which are well organized and these will afford a working basis for the national organization. The Automobile Dealers' Assn. of Illinois merged itself, thus making but one retail trade body in that state.

Industrial Betterment Show

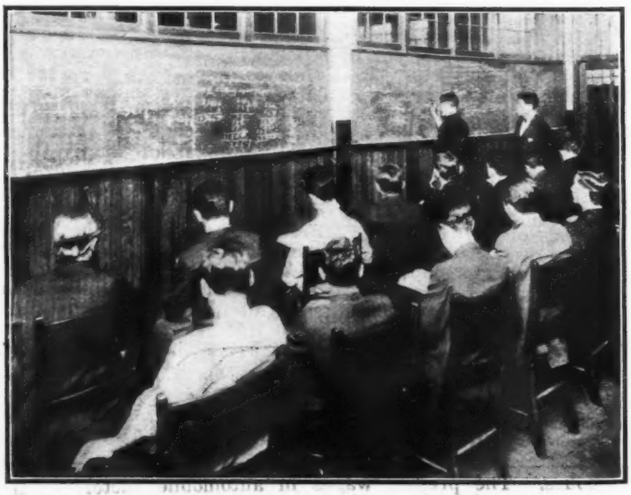
(*Continued from page* 907)

tern makers, eight blacksmiths, and 117 draftsmen. Another striking example was given in which a real estate company started a school for elevator operators and porters to teach them to become building superintendents in order to increase their value to such an extent that a much higher wage was given them.

In the Cadillac school of applied mechanics there are 150 pupils enrolled, of which thirty-four are completing the course and in which 3 hours a week is given to class work and 52 hours per week to shop work. Of the applicants, 10 per cent. are taken from the factory and 90 per cent. from outside.

A room at the exhibition was devoted to trade schools, night work, vocational schools and co-operative schools, showing the work done by public schools, universities and educational and industrial unions in carrying out the practical education of common school or university graduates.

An extensive exhibit of the methods used in arranging lunch rooms for employees attracted a notable degree of attention. Among the concrete examples shown were the rooms fitted up in the Pierce-Arrow plant and National Lamp Works. In Fig. 1, is shown the Pierce-Arrow lunchroom filled with employees of this concern. This large airy room is devoted only to this purpose. Lunches are served at cost price to the employees and the company stands back of the quality of the food which is served. The exhibit of the National Lamp Works' lunchroom was an interesting one. A model showing the arrangement of the lunch room and counter at which the employees are served was exhibited. The employee enters the lunchroom and at the counter provides himself with a tray, dishes, knife, fork, spoon, etc. He then is served with whatever he desires at the lunch counter and passes on to the eating room.



Class in arithmetic at the General Electric school

New Cars a Moderate Risk—Premiums Less in Mid-West

A 1914 $4,000 Model Will Get Policy at $5 Less While 1912 Model Costs 1 Per Cent. More

CLEVELAND, O., April 22—Revised schedules of fire and theft insurance on automobiles have just gone into effect in Ohio, Michigan, Indiana and other mid-western states. The Western Conference, an organization of which most of the underwriters of this kind of insurance are members, arranged the new schedules on a scientific basis, revising the rates to conform with the natural development of the automobile.

Analysis of the hazard develops that the new schedules vary from as low as 1 1-2 per cent. of insured valuation to 5 per cent. The rates have been adopted almost uniformly by companies dealing in automobile insurance.

The difference in the new from the old rates is in a slight increase on old machines and a perceptible decrease on new, high-class machines. The increase on cars two or more years old is approximately 1 per cent. of the insured valuation, while in dealing with new cars the rate has been reduced one-eighth of 1 per cent. The rate on new cars a year ago was about 1 1-8 per cent. of insured valuation, while this year the rate is 1 1-2 per cent.

The difference is noticeable, however, on high priced cars. On a car with an insured valuation of $4,000 the new rates mean a reduction of approximately $5 on the policy.

Certain underwriters, in addition to revising their rates, have extended the strength of their policies to carry an indorsement of all persons driving or riding in the car, except persons under 16 years of age driving and persons driving or riding in the car without the owner's consent.

One big national concern has established what is known as the "Dealers' Open Policy." It is for automobile dealers only and serves a long felt want. The dealer is given a register book and automatically insures his cars as they come to him. When a shipment arrives he registers the insurance and sends a duplicate copy to the underwriter. When the car is sold and taken off his sales floor he checks it off the register and cancels the policy with the underwriter.

The new rating of the Western Conference applies to all types of cars, pleasure and commercial. Where there was a different rating for the two types a year ago the same rating has been made to apply this year.

Philadelphia Truck Association Forms

PHILADELPHIA, PA., April 24—The Motor Truck Assn. of Philadelphia was organized this week at a meeting of commercial vehicle dealers in the new Hotel Adelphia. There are 20 charter members, who represent 26 of the leading motor trucks in the Philadelphia field.

The following officers to govern the association were chosen at the meeting: President, E. B. Jackson, of the Packard Motor Car Company, of Philadelphia; Vice President, E. Hare, of the Commercial Truck Company: Secretary, W. H. Metcalf, of the Bartlett Garages; Treasurer, J. D. Howley, of the White Motor Company.

Italian Imports Largely Light Cars

NEW YORK CITY, April 25—Of the 3,223 passenger vehicles exported in 1913 by Italy, as against 3,587 in 1912, 937 (1,000 in 1912) were received by England, and the remainder, in order, by France, Australia, Russia, Belgium, Austria, the United States (121 cars) and other countries.

The Italian imports are confined chiefly to light cars. In 1913, however, as a result of the strike during the touring season, 517 cars weighing over 1,000 kilos were imported, as against 364 in 1912; of these, 205 came from France, 172 from Germany, and 76 from the United States.

Of the 1,368 pleasure vehicles of various weights imported in 1913, as against 1,007 in 1912, 469 came from France, 344 from the United States, 260 in 1912, 308 from Germany, and other countries. The value of automobiles and automobile accessories exported from Turin to the United States, which was $295,013 in 1910 and $132,906 in 1912, fell to $114,047 in 1913, says a consular report.

The outlook for the current year is promising. No labor troubles will arise, owing to the agreement made between employers and employees, signed by both parties last June, by which the weekly working hours will be reduced to 58 in 1914 and to 57 in 1915. Wages will be increased so that earnings will not be lower, notwithstanding the shorter hours. The present wages in automobile factories range between a minimum of 5.79 cents per hour for laborers and a maximum of 14.47 cents for adjusters and finishers. The average factory wage is 8.68 cents per hour.

American exporters should offer light and cheap vehicles. The experiment of one American firm in shipping chassis without bodies was quite successful, as the Italian buyer prefers to order the coachwork to suit his individual taste. A light and inexpensive runabout would find a ready market in Piedmont.

Refuse $350,000 for Knox Plant

SPRINGFIELD, MASS., April 24—The auction sale of the Knox Automobile Co.'s estate was held here today. E. O. Sutton, representing the heirs of the late A. N. Mayo, former president of the company, and the largest creditors with claims against the estate aggregating nearly $1,000,000, bid $350,000. This was not accepted by the trustee who ordered a further attempt to auction the property.

It was stated by a majority of the stockholders that the sale would be fought on the ground that it was invalid, illegal and against the interests of the stockholders. These stockholders were represented by Attorney J. P. Wright of Boston.

The valuation of the plant, fixed by appraisers of the court, is about $1,600,000. Smaller parcels of land owned by the company were sold for $13,500 without opposition.

The sale has been continued to Wednesday, April 29, at 10.30 a. m. The one bid received is still held and the bidder, E. O. Sutton, announced that if he is successful in securing the property his intentions are to continue the building of pleasure cars, fire apparatus and tractors.

Ford Production Nears 600,000 Cars

DETROIT, MICH., April 22—More than a half million Fords have been built and sold to date. The five hundred thousand figure was passed about the middle of April. The company's big Highland Park, Mich., factory was speeded up and completed automobiles were being turned out at the rate of more then eleven hundred a day as the half million milestone was left behind. This was but a continuation of the pace set in March.

Since 1908 yearly car sales have grown phenomenally. That year the sales totaled more than six thousand, the next year they jumped to more than eleven thousand, the next year they were more than nineteen thousand, in 1911 they exceeded thirty-seven thousand; in 1912 they were more than seventy-four thousand, and in 1913 they were in excess of one hundred eighty thousand.

New N. Y. Ford Agency Sells on Terms

NEW YORK CITY, April 27—Partridge, Clark & Kerrigan, Inc., have taken over the Ford Agency and have inaugurated a deferred payment plan. The purchaser may pay $200 down and the balance in 6 per cent. notes at the rate of $50 a month; the paper will be endorsed by the dealers and discounted by their bankers. A mortgage on the car will act as security for the notes. In addition, the buyer must insure the car and must pay the freight, which is $21.50 to this city. The selling will not be on the "installment plan" in that the car is actually sold and payment accepted in money and paper.

The company is now handling three different makes, the Premier-Weidely, Briscoe and the Ford.

Standard Form of Compensation Policy Issued

NEW YORK CITY, April 29—The New York State Insurance Department has prepared a standard form of policy to be issued by stock companies for workmen's compensation insurance. The policy form covers employers' liability for compensation and medical benefits required under the New York Workmen's Compensation law; it also covers the employer's liability for negligence claims that may be brought against him by injured workmen or their dependents.

The policy contains the standard provisions required by the New York compensation act. An injured workman or his dependent may recover directly from the insurance company. The insolvency of the employer does not relieve the company from the obligation to pay compensation. The policy may be cancelled upon 10 days' notice given in accordance with the requirements of the workmen's compensation law. The cancellation of the policy will not affect claims that have arisen while the policy was in force. The company will be required to meet all payments under such claims. If the compensation act is declared invalid or unconstitutional the premium will be readjusted in an equitable manner subject to the approval of the superintendent of insurance. Executive officers are included in the payroll at a sum not exceeding $1,200 per annum for each officer.

A standard form of policy to be issued by mutual companies authorized to transact workmen's compensation insurance, is also being prepared by the department.

Patents Up for Re-Argument in Stromberg-Zenith Battle

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New Prosecution Dropped for Second Discussion of Ahara and Richards Letters in Injunction Case

CHICAGO, April 25—The Stromberg Motor Devices Co. which recently obtained a permanent injunction against John A. Bender, Chicago, who sold Zenith carbureters on Keeton cars, has accepted the challenge of the Zenith Carbureter Co. of Detroit to have the case involving the Ahara and Richards patents re-argued in U. S. District court on May 4. As the case stood a few weeks ago the Zenith company was awaiting action from the Stromberg company and the latter was about to bring the work of prosecution in Detroit when the challenge was issued. The acceptance of this made the work in Detroit unnecessary. Although in its bill of complaint the Stromberg company names two other patents besides the Ahara and Richards, the new ones will not be taken up at the May hearing because testimony has not yet been taken. The new patents involved are the Anderson and the Sturtevant. The former, No. 1,063,141, issued on May 27, 1913, to Raymond M. Anderson, relates to the Stromberg model E which has not been pushed extensively by the Stromberg company. The latter concern is in possession of the Anderson patent through mesne assignment from Raymond Anderson. The Sturtevant patent, No. 755,074, issued March 22, 1904, relates to a double carbureter and was issued to Thomas L. Sturtevant and Thomas J. Sturtevant. A re-issue was granted on this patent in November, 1906, and the patent assigned to the Sturtevant Mill Co., the re-issue number being 12,611. Stromberg bought the patent from the Sturtevant Mill Co.

As the case now stands the Stromberg company is asking for a preliminary injunction against the Zenith company and the U. S. District court for the Northern district, sitting in Chicago, will decide whether or not this should be granted.

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NEW YORK, April 23—The English Zenith Co., having had its attention brought to a patent taken by the Stromberg Motor Devices Co. of Chicago, which covers a carbureter of the "plain tube type," have lodged in the English Patent office an opposition to the granting of this patent as they deem it "too crude an attempt" to evade the well-known Baverey patents which they control for England.

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Market Reports for the Week

A general reduction in the metals markets occurred in last week's markets. Tin came down $1.05 per 100 pounds, breaking violently on Friday, when it dropped to $34.40 from $35.50. At the closing on Tuesday, there was some demand for future positions, but the volume of business was not important. Both electrolytic and Lake coppers dropped $0.00 1-8 per pound. Some little business was done in electrolytic. According to present indications there will be an increase of at least 10,000,000 pounds in surplus stocks of copper during the month of April carried by producers and the increase may be much larger. Both Bessemer and Open-Hearth steels came down $1.00 per ton. Lead was dull at an advance of $0.10 per 100 pounds. Both Pennsylvania and Kansas petroleum again dropped, the former $0.10 and the latter $0.05.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.05¾	.05¾	.05¾	.05¾	.05¾	.05¾	.....
Beams & Channels, 100 lbs.	1.31	1.31	1.31	1.31	1.31	1.26	— .05
Bessemer Steel, ton	21.00	21.00	21.00	20.00	20.00	20.00	—1.00
Copper, Elec. lb.	.14¼	.14 3/20	.14	.14	.14⅛	.14⅛	— .00⅛
Copper, Lake, lb.	.14⅜	.14⅛	.14⅛	.14⅛	.14¼	.14¼	— .00⅛
Cottonseed Oil, bbl.	7.43	7.44	7.30	7.24	7.19	7.22	— .21
Cyanide, Potash, lb.	.17	.17	.17	.17	.17	.17	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline, Auto, bbl.	.16	.16	.16	.16	.16	.16	.....
Lard Oil, prime	.93	.93	.93	.93	.93	.93	.....
Lead, 100 lbs.	3.80	3.80	3.80	3.90	3.90	3.90	+ .10
Linseed Oil	.54	.54	.54	.54	.54	.54	.....
Open-Hearth Steel, ton	21.00	21.00	21.00	20.00	20.00	20.00	—1.00
Petroleum, bbl., Kans., crude	.85	.85	.85	.85	.80	.80	— .05
Petroleum, bbl., Pa., crude	2.20	2.20	2.20	2.20	2.10	2.10	— .10
Rapeseed Oil, refined	.59	.59	.59	.59	.59	.59	.....
Rubber, Fine Up-River, Para	.74	.74	.75	.75	.74	.74	.....
Silk, raw Ital.	....	....	5.10	....	5.10	5.10	.....
Silk, raw Japan	....	....	4.38	....	4.38	4.40	+ .02
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	35.50	35.50	34.40	34.40	34.75	34.45	—1.05
Tire Scrap	.04¾	.04¾	.04¾	.04¾	.04¾	.04¾	.....

Attacks Kelly-Springfield Readjustment

NEW YORK CITY, April 27—An effort is being made by A. M. Polack, a curb broker, of 25 Broad street, this city, to secure proxies for the annual meeting of the Kelly-Springfield Tire Co., to be held May 4. He contends that the plan to readjust the capital is unfair. He points out that with outstanding 4 per cent. debenture income bonds of $2,850,500, which are not a mortgage or lien of any sort, interest on which is payable only if earned and not cumulative, and with a sinking fund of 4 per cent. to buy at 102 1-2, the sinking fund only to operate if the money is earned, there are few industrial companies with a security more favorable to themselves. He claims that, whereas the charges which may accumulate against the company under the present capitalization amount to but $68,970 per year, under the proposed plan the accumulation would be $411,229 each year.

"The proposal to exchange these bonds," Mr. Polack states, "for 6 per cent. cumulative preferred stock of the Kelly-Springfield Tire Co., redeemable at 110 per cent., is detrimental to the interests of the company and its stockholders and not demanded by an exigency of the company.

"The company now need not pay anything in any year on the bonds it there are not sufficient earnings, and there is no charge of any kind to be carried over. If a sufficient sum over the interest on the bond issue is earned, up to 4 per cent., it is used for the gradual extinguishment of the debt, and in a very few years, under favorable circumstances, the income bonds would all be canceled and the property belong to its stockholders.

"The other part of the scheme, of allowing the present holders of the 6 per cent. cumulative preferred stock to fund their accumulation of 78 1-2 per cent. back dividends into a 7 per cent. second preferred cumulative convertable stock is also open to criticism. When the proposition of capitalizing the back dividends was first considered a 4 per cent. scrip, payable at the pleasure of the company, was talked of and met with approval. Then a 4 per cent. scrip, payable in a number of annual instalments, was discussed.

"While it is true that this 78 1-2 per cent. of back dividends is payable to the cumulative preferred stockholders, it is not something that they are entitled to or can collect at once in cash, but it is payable over a series of years, if earned, and proper allowance would have to be made to provide the company with sufficient working capital. If the preferred stockholders want a security for the accumulated dividends they should take a security which is worth 100 cents on the dollar, instead of trying to grab a security which would be worth a substantial premium."

The report shows the capitalization and charges each year as follows:

$2,850,500 income bonds, interest, if earned	$114,020
Sinking fund on the bonds, if earned	114,020
$1,149,500 6 per cent. cumulative preferred stock, dividends on same	68,970
Total	$297,010

of which only $68,970 is a cumulative charge against the earnings of the company.

"It is also against the interest of the present preferred stockholders to accept the proposed plan," states the report, "as the company is now capitalized, if earnings were to decline to a figure where dividends could not be paid, only $68,970 per year would accumulate to be out of earnings, as against $411,229 under the proposed plan."

The following is submitted under the proposed plan:

$4,239,200 6 per cent. cumulative preferred stock—dividends on same	$54,352
Two per cent. annual cumulative sinking fund on above	84,784
$1,029,900 7 per cent. cumulative second preferred stock—dividends on same	72,093
Total	$411,229

The report goes on to say that all of this $411,229 accumulates annually and is a charge against present and future earnings, and must be paid out each year before the common stock can get any dividends.

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N. Y. License Fees Exceed $1,000,000

NEW YORK CITY, April 27—Since the opening of new registrations motorists in this state have contributed $1,008,598.25 against $891,472.80 collected in the same period last year; that is, from February 1 to April 25. This city has received about half this sum, $556,337.25 being the contribution by the local motorists. The rest was divided about equally between Albany and Buffalo.

Much Waste Gasoline in Garage Sewers? N. Y. Says So

A Respite of Four Weeks for New Tests in Fight on Separator Ordinance

NEW YORK, April 23—A "truce" of four weeks has been declared in the war of the garagemen and dealers of the city against the gasoline separator ordinance. During this period no prosecutions will be attempted and the "bombardment" of the ordinance will be stayed until the results of the tests are made known.

Tests are to be made of garage drainage to determine the quantity of "live" gasoline and oil that may reach city sewers, and if the separator has efficiency alleged by its makers and disputed by the garagemen.

Fire Commissioner Robert Adamson presided at the hearing today, attended by fifty representatives of the four garage and dealers' associations in Manhattan and Brooklyn, among whom were R. H. Johnston, president of the Automobile Dealers' Association of New York; John G. Snyder, attorney for the Garage Owners' Board of Trade of Brooklyn; Charles Thaddeus Terry, attorney for the New York dealers; and Secretary Stewart of the New York City and state dealers bodies.

Garagemen were amused at the estimates of a member of the Municipal Explosives Commission of the amount of gasoline that gets in sewers. When William Burrows of the Niagara Garage disputed statements of McNutt, owner of the McNutt Oil Separator Co. of New York City, McNutt offered to present the garage with a separator free if it would not collect a certain amount of gasoline in a certain time. The challenge was taken.

Company Buys Separator Trappage

The hearing brought out the claim that the McNutt Oil Separator Co. is so confident that separators, especially its own, catch gasoline and oil that it has engaged in the business of taking away this trapped product and refining it. The company also removes waste matter lying about the garage, and for the oil and gasoline waste pays about one cent a gallon.

Herreshoff Light Car Co. Chartered

MECHANICSVILLE, N. Y., April 27—The Herreshoff Light Car Co., Inc., has been incorporated with a capital of $100,000. The incorporators are C. E. Herreshoff, N. R. Holmes and A. L. Johnson. This company will manufacture a runabout costing $500. A description of the car was given in THE AUTOMOBILE of February 19.

S. African Car Imports Grow 92 Per Cent.

NEW YORK CITY, April 27—A statement has been made by Sir Owen Phillips in South Africa that the prosperity of that country is to be gauged by the number of automobiles imported into it. Last year the value of such imports was $5,391,243, against $2,812,467, an increase of 92 per cent. within a single year.

Automobile Securities Quotations

NEW YORK CITY, April 29—Automobile stocks were rather quiet during the past week, though the favorable reports of big sales and busy factories gave a tone of strength to some which had not been so pronounced before. Yesterday several of the stocks experienced slight gains, among them being Chalmers preferred, Goodrich common, Studebaker common and preferred, U. S. Rubber common and Vacuum Oil. Willys-Overland common was a little weak after its steady upward trend of the past few weeks, while Lozier common also showed a slight decline.

Security	Wednesday Bid	Wednesday Asked	Thursday Bid	Thursday Asked	Friday Bid	Friday Asked	Saturday Bid	Saturday Asked	Monday Bid	Monday Asked	Tuesday Bid	Tuesday Asked	Week's Change	1913 Bid	1913 Asked
Ajax-Grieb Rubber Co. com	200	..	200	..	200	200	200	200	200	200	200	..	..	150	160
Ajax-Grieb Rubber Co. pfd	99	102	99	102	99	102	99	102	99	102	98	102	..	94	98
Aluminum Castings pfd	98	100	98	100	98	100	98	100	98	100	98	100	..	98	100
Case, J. I., T. M. Co.	80⅛	82½	80	82	80	82	80	82	80	82	80	87½	—2¼	..	..
Chalmers Motor Co. com	82½	87	82½	87	82½	87	82½	87	82½	87	..	82½	..	126	133
Chalmers Motor Co. pfd	..	83	..	82	..	83	..	83	..	83	92	94	..	98	102
Electric Storage Battery Co	49¾	50¼	49½	50	49½	50	49¼	49¾	49½	50	49	50	— ½	..	..
Firestone Tire & Rubber Co. com	280	285	280	285	280	285	280	285	280	285	283	288	—1	260	266
Firestone Tire & Rubber Co. pfd	107½	109	107½	109	107½	109	107½	109	107½	109	108	109½	+ ½	104	106
Garford Co. pfd	80	90	80	90	80	90	80	90	80	90	75	85	—5	99	100½
General Motors Co. com	78½	79	77	78⅛	75	76	72¼	75	72¼	75	74½	76	—1½	26¾	29
General Motors Co. pfd	90¼	92	90¼	92	89½	90½	91	92	91	92	90	91	— ½	70	74
B. F. Goodrich Co. com	27	27¾	26½	27	24¾	25⅜	28¾	29¼	28¾	29¼	26¾	27	+¾	30	31
B. F. Goodrich Co. pfd	88½	90	88½	90	88½	90	88	89½	88	89½	87½	89	—1	94	97
Goodyear Tire & Rubber Co. com	165	170	165	170	165	170	165	170	165	170	168	172	—2	310	322
Goodyear Tire & Rubber Co. pfd	96	99	96	99	96	99	96	99	96	99	94	95½	—1	100	101¼
Gray & Davis Co. pfd	90	97	90	97	90	97	90	97	90	97	90	97	..	..	..
International Motor Co. com	..	5	..	5	..	5	..	5	..	5	..	5	..	5	10
International Motor Co. pfd	..	15	..	15	..	15	..	15	..	15	..	15	..	20	40
Kelly Springfield Tire Co. com	55	58	55	58	55	58	50	58	50	58	53	56	—2	..	..
Kelly Springfield Tire Co. pfd	135	145	135	145	135	145	136	..	136	..	135	138	..	..	..
Lozier Motor Co. com	19	..	19	..	19	..	19	..	19	..	..	30	—2	..	..
Lozier Motor Co. pfd	..	65	..	65	..	65	..	65	..	65	..	55	..	..	..
Maxwell Motor Co. com	8¼	9	8¾	9	8½	9	8	8⅜	8	8¼	7¾	8¼	— ¼	3	5
Maxwell Motor Co. 1st pfd	34¼	35½	35	35½	35	35½	34¼	34¾	34	35	33¼	34¼	+ ¼	40	50
Maxwell Motor Co. 2d pfd	12⅛	12½	13	13½	13	13½	12	13	12	12½	12½	13¼	+ ½	12	16
Miller Rubber Co.	135	140	135	140	135	140	135	140	135	140	131	140	—4	155	160
New Departure Mfg. Co. com	122	123	122	123	122	123	122	123	122	123	122	124	—1	..	..
New Departure Mfg. Co. pfd	105	106	105	106	105	106	105	106	105	106	105½	107	+ ½	..	..
Packard Motor Co. com	103	..	103	..	103	..	103	..	103	..	103	..	..	..	..
Packard Motor Co. pfd	94	98	94	98	94	98	94	98	94	98	94	98	..	..	..
Peerless Motor Co. com	15	..	15	..	15	..	15	..	15	..	18	25	+3	35	45
Peerless Motor Co. pfd	..	75	..	75	..	75	..	75	..	75	..	70	..	95	100
Pope Mfg. Co. com	2	5	2	5	2	5	2	5	2	5	2	4	..	16	20
Pope Mfg. Co. pfd	12	15	12	15	12	15	12	15	12	15	10	15	..	52	56
Portage Rubber Co. com	..	25	..	25	..	25	..	25	..	25	..	30	..	35	41
Portage Rubber Co. pfd	..	75	..	75	..	75	..	75	..	75	..	85	..	85	90
*Reo Motor Truck Co.	7	8¼	7	8¼	7	8¼	7	8¼	7	8¼	8¾	9¼	+1¾	11⅝	12⅛
*Reo Motor Car Co.	19¼	19¾	19¼	19¾	19¼	19¾	19¼	19¾	19¼	19¾	20¼	21½	+1¼	20¾	21¼
Rubber Goods Mfg. Co. pfd	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Russell Motor Co. com	60	61	60	61	60	61	60	61	60	61	..	..	..	..	..
Russell Motor Co. pfd	100	102	100	102	100	102	100	102	100	102	..	..	..	..	..
Splitdorf Electric Co. pfd	40	50	40	50	40	50	40	50	40	50	40	50	..	..	..
Stewart Warner Speedometer Corp. com.	60	61	60	61	60	61	60	61	60	61	50	53	—5	..	..
Stewart Warner Speedometer Corp. pfd	100	102	100	102	100	102	100	102	100	102	97	100	—2	..	..
Studebaker Co. com	30½	31	29½	29¾	27	28	26½	28	29¼	29⅞	32½	34	+1½	27½	29
Studebaker Co. pfd	84½	86	83	85	82	83	81	82	82	84½	83	86	—2	88	90
Swinehart Tire & Rubber Co.	60	65	60	65	60	65	60	65	60	65	62	66	+2	84	87
Texas Company	140¾	141	140	140½	138½	139	138	138½	138½	139½	139	140	..	..	..
U. S. Rubber Co. com	55	55½	54½	55	53⅞	54	53¼	54	53½	54½	53½	54	—2¾	60	61
U. S. Rubber 1st pfd	100½	101½	100½	101	100	100¾	99⅝	99⅞	100	107½	99½	100	—2	103½	104
Vacuum Oil Co.	215	225	215	225	215	225	215	225	215	225	217	219	+5	..	..
White Co. pfd	107	110	107	110	107	110	107	110	107	110	107	110	..	107	109
Willys-Overland Co. com	64	67	65	67	63	66	63	66	63	66	61	63	—4	57	62
Willys-Overland Co. pfd	89	93	89	93	89	93	89	93	89	93	89	90	..	90	97

*The par value of these stocks is $10; all others $100.

Seller of Defective Parts Liable for Any Injuries

Responsibility Rests in Assembly—Part Maker Absolved in "Collapsed Wheel" Test Case—$8,000 Awarded

SYRACUSE, N. Y., April 25—It has been ruled in the United States Court in this city, that the occupant of an automobile who is injured by the breaking of a certain part of the car can recover damages from the company which assembled and sold the automobile rather than from the manufacturer of the part that broke.

On this ground $8,000 damages was awarded to E. W. Johnson of Amsterdam, N. Y., against the Cadillac M. C. Co. of Detroit. Mr. Johnson sued the company to recover damages for injuries received in 1909 when a Schwarz wheel on his automobile broke and the car turned turtle. The company contended that if any one was liable, except the plaintiff, it was the manufacturer of the wheel.

This was a test case, and the outcome was awaited by automobile makers throughout the country. The wheel is made by the Schwarz Wheel Co., Philadelphia.

All Vehicles Must Respect Safety Zones

NEW YORK CITY, April 27—With reference to the ordinance and police regulation which states that "a vehicle in overtaking or meeting a street passenger car which has been stopped for the purpose of receiving or discharging a passenger or passengers, shall not pass or approach within 8 feet of such car so long as such car is stopped," a meeting was recently held at the Lawyers' Club, where it was unanimously resolved that the attention of Police Commissioner Woods of this city be called to the fact that the ordinance applies to all vehicles and not only to automobiles.

Recently an owner and his driver were both held liable for disobeying this rule. It was held by the magistrate that the owner of the vehicle therein was liable, in like manner as the chauffeur, for approaching within 8 feet of the street car.

Roads Need Not Be "Car Safe"

MILWAUKEE, WIS., April 27—That townships in Wisconsin are under no statutory liability to owners of motor cars for damage to their vehicles or to passengers therein growing out of their failure to keep their roads in a safe condition for motor car traffic, is the decision of Judge James O'Neill of the circuit court at Black River Falls, Wis., in the case of C. E. Johnson of Chippewa Falls, Wis., vs. the township of Alma, Buffalo County, to recover damages for the destruction of his car by fire while passing over a road covered with loose straw to a depth of 12 to 15 inches. Judge O'Neill holds that the township has fulfilled its whole duty when it constructs and maintains its roads in a reasonably safe condition for ordinary traffic by carriage or wagon. It has been a common practice in northern Wisconsin counties where roads are unusually sandy to cover the entire roadway with loose straw and instances have been known of big forest fires originating from ignition of this straw. The case is of great interest to motorists and will be appealed.

Weed Co. in Its Chain Factory

NEW YORK CITY, April 27—To meet the increasing demand for its product the Weed Chain Tire Grip Co. has built a plant at Bridgeport, Conn., where all of its activities will be concentrated in the future. The production, it is stated, at present requires the making of 60 miles of chain a day.

DETROIT, MICH., April 27—The Dodge Bros. Co. has announced the appointment of George C. Hubbs as assistant general sales manager in charge of promotion and advertising. Mr. Hubbs was formerly advertising manager of the United States Tire Co., and takes up his new duties on May 15.

"Owner-Agent" Clause Stirs Underwriters

NEW YORK CITY, April 27—The new family clause in automobile liability policies has caused quite a stir among the liability underwriters. Several months ago there was a decision by the appellate division of the New York supreme court holding that a wife driving her husband's automobile for her own pleasure is not the agent of her husband and consequently she cannot be held legally liable for injury sustained through her negligence. The decision made a stir among the brokers because it had not been before realized that the commonly constructed automobile liability policy covered no more than the owner himself and his employee hired by him to run the course or some one bound on the business of the owner.

Coverage of a wife or person who cannot be considered an agent of the owner has heretofore been subject to an added premium of 15 per cent. of the rate of the original policy. The new clause not only covers the wife, but the family and all others who may be legally driving the car and who are not paid servants.

Railroads to Charge for "Spotting" Cars

WASHINGTON, D. C., April 28—*Special Telegram*—Closely following the complaint filed by Ford and other motor car companies of Detroit against "spotting" cars came the announcement today that railways operating in Eastern Classification territory have adopted the evident suggestion given them by the Interstate Commerce Commission and have begun to file tariffs providing for charge for "spotting" cars. The provisions and charges contained in the tariffs are identical in all instances, indicating concerted action on the part of the roads. The charges are 5 1-2 cents a ton, with a minimum charge of $2 a car.

In Eastern Classification territory it is estimated that there are nearly 27,000 spur tracks, or sidings, on which cars now are "spotted" by the railroads without charge. The exaction of $2 a car for the service, it is believed, would increase the revenues of the roads at least $10,000,000 a year.

An effort will be made by shippers to have the tariffs, which are filed to be effective on 30 days' notice, suspended. If they should be suspended that action would serve to bring the reasonableness of a charge for car spotting to an issue.

Semple Rubber Co. Formed in Trenton

TRENTON, N. J., April 27—The Semple Rubber Co., this city, has been formed with a capital stock of $125,000 to manufacture inner tubes. Later in the season it expects to be in a position to also make outer cases. It expects to start active manufacturing within 3 weeks. C. H. Semple, at one time president of the G. & J. Tire Co., Indianapolis, Ind., and who retired about 2 years ago from the presidency of the Empire Tire Co., Trenton, is president, with F. A. Drake, treasurer, and R. H. LaPorte, secretary.

The company has taken the plant formerly occupied by the American Porcelain Works in Trenton, at Murray street and the Belvidere Division of the Pennsylvania R. R. The plant is now being overhauled and re-arranged, and the installation of machinery will start next week.

Stanweld Secures Basic Patent

CLEVELAND, O., April 24—The efforts of the Standard Welding Co., of this city to secure basic patents on the single-piece transverse-split demountable rim have resulted in the acquisition of patent No. 707,538 issued to John Baker, formerly of Meacham, Ill., on an improved rim and felloe for rubber vehicle tires. The claims of the patent are broad, specifying that the object of the invention is to provide a rim that can be contracted to be inserted in an endless tire and then expanded to receive the tire, and be held in such expanded position by the felloe. Means are also provided for preventing relative lateral movement of the split ends of the rim.

Harrison Radiator Has Detroit Plant

DETROIT, MICH., April 28—*Special Telegram*—To take care of its increasing business in this city the Harrison Mfg. Co. Lockport, N. Y., has leased a factory building here and will devote it to the making of the Harrison radiator. Gould Allen, manager of the Detroit office of the concern and also representative for the Covert Motor Vehicle Co., which is financed by the same capital, will manage the new Harrison factory.

NEW YORK CITY, April 27—"Price maintenance," as provided in the Stevens bill now before Congress, will be the subject of a hearing of the committee on commercial law of the Merchants' Association at a meeting April 29. If it is wise for a manufacturer to be given the power to fix uniform wholesale and retail prices for his products, as provided in the measure, and whether the anti-monopoly clause is sufficiently strong, will be discussed.

To Seal Starting Devices in Non-Stop, Day-Night Run

Controls Fixed, Entry Blanks Drawn for Chicago-Boston Reliability—Night Schedule, 18 Miles Per Hour

CHICAGO, April 27—Plans for the American Automobile Association's national reliability tour for the Glidden, National and Anderson trophies, which will be handled direct by the Chicago Automobile Club and under the supervision of the A. A. A. contest and touring boards now have assumed definite shape and entry blanks for the event will be out this week.

The contest will be a day and night non-motor-stop run from Chicago to Boston, starting at 2 o'clock in the afternoon of June 29 from Chicago and finishing at Boston at noon on July 2, a distance of 1,276 miles, with the controls at Bryan, O., Cleveland, O., Buffalo, N. Y., Syracuse N. Y., Albany, N. Y., and New York City. A special train will accompany the tour carrying the officials, newspaper men, relief drivers, observers and mechanics.

Three Classes In Tour

Plans have been amplified since the first announcement of the C. A. C. and instead of there being only the Glidden trophy up for competition application has been made for the National and Anderson cups which have been used in other national tours. This means three classes in the tour and a division in the stock car class for manufacturers. In this section there has been a price division made. Cars listing at over $1,200 will compete for the Glidden; those $1,200 and under will run for the National trophy, while in the owners' division, which will be non-stock, the Anderson cup will be offered. In addition certificates of gasoline economy will be issued to those desiring them by the technical committee. Entrants completing the run without a motor stop also will be given certificates for meritorious performance.

The winners will be determined as follows:

1—*Cars must make non-motor-stop run.*

2—*Time penalties: Cars will be penalized 1 point per minute or fraction thereof for lateness at controls. All competing cars must maintain a running schedule of 20 miles per hour between sunrise and sunset, 15 miles between sunset and sunrise the first night and 18 miles per hour between sunset and sunrise the other nights.*

3—*The regular penalties prescribed by the 1914 A. A. A. contest rules will be enforced with the following exceptions:*

A—Stoppage of the motor voluntarily or involuntarily either in or out of controls at any time during the entire contest will disqualify.

B—No penalty will be imposed for repairs, replenishments or replacement of tires or the fitting, repairing or removing anti-skid devices, but the time consumed in such tire work will not be added to the running schedule. Replacement or cleaning of spark plugs is permitted on the road, but time is not added to the running schedule.

C—Where penalties are imposed for time consumed in work by drivers, passengers or others, the time so consumed shall be added to the running schedule.

D—The use of self-starters is prohibited under penalty of disqualification, and where self-starting is a part of the equipment of the competing car the self-starting connection shall be disconnected and sealed by the technical committee previous to the start. On all cars the starting crank will be sealed.

E—Competing cars must be delivered to the C. A. C. technical committee for preliminary examination at a time and place to be hereafter named, at least 24 hours prior to the start.

Simple Stock Car Registration

The A. A. A. has drafted a stock car definition which will call for registration of the different models by the manufacturers but the definition is so simple that it will not be necessary for the technical committee to visit the various factories. There will be no charge and the registration will take the form of a sheet calling for the number of cylinders; bore; stroke; make and model of magneto; make, model and size of carbureter; tire sizes; wheelbase and such equipment as starters, lighting, shock absorbers, horns, etc.

The only alterations from stock permitted is in the case of cars equipped with pressure gasoline systems which will be allowed an auxiliary gravity fuel tank to keep the motor running while pressure tanks are being replenished. The tap controlling the flow of fuel from the auxiliary tank must be operable from the driver's seat.

In case of ties for the trophies, prizes will be awarded on the basis of a final technical examination and test in which penalties will be assessed for faulty brakes, broken radius rod, bent axles, missing cylinder, broken springs, faulty steering gear and faulty gearset.

Entries Are Assured

Entry fees have been placed at $50 each in the owners' section, while in the stock car division the makers are asked to pay $150 for the first car, $250 for two and $300 for three. Entries close June 1 so that the club will have time to make its plans.

That there will be plenty of entries now seems assured, especially among the owners. Such firms as Lozier, Franklin, Moline-Knight, Premier, Buick, Maxwell and Jeffery seem inclined to participate, while as soon as the entry blanks are out the following owners have promised to fill them out: Harry Vissering, Alco; E. C. Patterson, Packard; J. T. Brown, Moline-Knight; Charles S. Hatch, Stutz; Morton H. Luce, Marmon and A. M. Robbins, Jeffery. In the owners' division agents or makers may compete, providing they own the car they enter. It also is stipulated that an owner must take his turn at the wheel.

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French Racers in Practice

PARIS, April 15—Most of the European cars entered for the Indianapolis race are being shipped this week. The two Delages, to be driven by Albert Guyot and Rene Thomas, spent Easter Monday and Tuesday on the road with the exact gearing and the equipment to be used on the track. The gear ratio is 3 to 1, which was the ratio originally adopted for last year's Grand Prix, but changed later for a higher ratio.

Not many mechanical changes have been made on the Delage cars. Guyot has fitted a streamline tail enclosing his gasoline tank and has got rid of a little superfluous weight. No attempt has been made to set the cars lower to the ground, for it has been found practically impossible to overturn them, and it is admitted that they hold to the road better than any cars seen in last year's European races.

Jean Chassagne, who is at present taking part in the Monaco motorboat carnival, reports that his six-cylinder Sunbeam is a special light weight chassis with only two speeds and a gear ratio on top of 3 to 1. The motor is one of the smallest in the race, and Chassagne hopes to get his advantage by reason of low weight, rapid pick-up, and a few tire changes. His motor is equipped with two Claudel carbureters. It is stated that after taking the bends at Brooklands at 56 miles, the car could attain a speed of 99 miles an hour within a quarter of a mile.

The Peugeot drivers, Goux and Boillot, are using last year's cars with detail modifications. The motor is practically unchanged. The chassis has been set several inches lower, the front as well as the rear springs being set below the axles. Houdaille shock absorbers are used both front and rear. To enable them to make their turns at a higher speed, the Peugeot men have filled the left hand frame member with lead. Rudge Whitworth wire wheels are fitted.

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Braender to Enter 500-Mile Race

NEW YORK CITY, April 27—Harry Braender, vice-president of the Braender Rubber & Tire Co., announces his company will enter a car in the Indianapolis 500-Mile Race May 30.

The machine will have a Dusenberg motor with a piston displacement of 350 cubic inches and a wheelbase of 105 inches. Cylinders are 4 7/16 by 6 inches and give about 60 horsepower. The car will be known as the Braender Bulldog. Ralph Mulford, who is designing the car, says it is nearly ready for its first test run. The car will be equipped with Dunlop wire wheels and a Bosch magneto.

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Speedway Trial Heats May 27

INDIANAPOLIS, IND., April 26—With the entry of a Tulsa, three Great Westerns, a Bugatti and a Keeton in the 500-Mile Race, the total entry list to date is thirty-three cars. The Tulsa is entered by George Clark, of Fort Worth, Tex. This car ran in last year's race. Clark will pilot it.

The Great Western cars are entered by Johnny Jenkins, D. A. Jenkins, his brother, and E. A. Myers, an official in the Pittsburgh motors concern, whose power plant is being used. Jenkins himself will drive one of the cars and Ray Price, the other. The man for the third has not been selected as yet.

Because more than thirty entries are already in hand for the race, and only thirty of these will be allowed to start, the qualifying time trials this year become much more important than heretofore. This year only the thirty fastest

cars entered will be allowed to start. These qualifying time trials will take place Wednesday, May 27, starting at 10 a. m. and finishing at sundown.

A commendable change this year is the rule requiring the changing of steering knuckles, tierods, etc., two days previous to the race. This ruling was found necessary because of previous accidents and other threatened accidents. Also the management will this year conduct a medical examination of all drivers and mechanics.

The present schedule calls for the medical examination Tuesday evening, May 26; the qualifying trials, Wednesday, May 27, and the instruction meeting for drivers, mechanics and officials, Thursday, May 28.

The list of entries to date follows:

Car	Driver	Entrant
Beaver Bullet	Keene	Beaver Auto Co.
Bugatti	Not named	Ettore Bugatti.
Burman	Burman	W. S. Thompson.
Burman	Billy Knipper	W. S. Thompson.
Delage	Thomas	Delage Co.
Delage	Guyot	Delage Co.
Excelsior	Christiaens	Excelsior Co.
Gray Fox	Wilcox	E. P. Fox.
Great Western	Jenkins	J. Jenkins.
Great Western	Not named	E. A. Myers.
Great Western	Price	D. A. Jenkins.
Keeton	Not named	R. Burman.
King	A. Klein	King Motor Co.
Marmon	Dawson	Chris. E. Erbstein.
Maxwell	Carlson	Maxwell Motor Co.
Maxwell	Not named	Maxwell Motor Co.
Maxwell	Tetzlaff	Maxwell Motor Co.
Mercedes	De Palma	E. C. Patterson
Mercedes-Peugeot	Mulford	E. C. Schroeder.
Mercer	Bragg	Mercer Automobile Co.
Mercer	Pullen	Mercer Automobile Co.
Mercer	Wishart	Mercer Automobile Co.
Metropol	Joe Horan	Metropol Motors Corp.
Peugeot	Boillot	Peugeot Co.
Peugeot	Duray	J. Meunier.
Peugeot	Goux	Peugeot Co.
Stafford	Callahan	Stafford M. C. Co.
Stutz	Anderson	Stutz M. C. Co.
Stutz	Cooper	Stutz M. C. Co.
Stutz	Oldfield	Stutz M. C. Co.
Sunbeam	Chassagne	Sunbeam Co.
Sunbeam	Grant	William Zeigler.
Tulsa	Clark	Clark.

May Take Over Manhattan Club Rooms

NEW YORK CITY, April 29—Plans are under way by which the main floor, the pool room, and everything on that floor of the Manhattan Automobile Club in the Gainsborough Studios building at 222 West Fifty-ninth street, will be taken over by the Motor Contest Dealers' Assn., as a clubroom and a place for its members to meet at luncheon. A meeting will be held on April 30 when definite arrangements will be made.

Big Cycle Car Exposition for Detroit

DETROIT, MICH., April 27—This city has been chosen as the rendezvous for all the cyclecar forces on July 4 and 5, when the Cyclecar Exhibition Co., a New York City organization, will hold the world's first International Cyclecar Exhibition and race meet at the State Fair Grounds and on the dirt track.

It is planned to utilize three of the exhibition buildings for the showing of cyclecars, etc. The main building will be utilized for the exhibition of typical cyclecars, one of the adjacent buildings for the small cars, light cars and motorette show, and the third building in the group for the exhibition of commercial cyclecars and accessories. The three buildings allow an approximate 60,000 square feet of floor space.

An extensive race program has been arranged for the two-day meet, which is to be held under the contest rules of the Cyclecar Assn. of America, and the prizes and trophies for the races will aggregate about $5,000, it is said. The events of the 2 days are as follows:

July 4

Event No. 1—Five miles for Class A stripped stock (71 cubic inches limit). Prizes—Silver cups to first and second.

Event No. 2—Two miles for Class B (71-100 cubic inches) stripped stock. Prizes—Silver cups to first and second.

Event No. 3—Ten miles for Class C stripped stock (100-125 cubic inches); standing start. Prizes—Silver cups to first and second.

Event No. 4—Five mile handicap for Classes A and B (up to 100 cubic inches) stripped stock; standing start. Prizes—Silver cups to first and second.

Event No. 5—Ten mile handicap for Classes B and C, stripped stock (71-125 cubic inches); standing start. Prizes—Silver cups to first and second.

Event No. 6—Five mile international free-for-all (125 cubic inches limit). Prizes—Silver cups to first and second.

Event No. 7—Twenty-five mile free-for-all (125 inch limit); standing start.

July 5

Event No. 1—One mile for Class A (71 cubic inches limit), strictly stock. Prizes—Silver cups to first and second. (Note—Entrants to this event will be required to enter with regular catalog equipment and carry the full number of passengers.)

Event No. 2—Three miles for Class B (71-100 cubic inches), strictly stock. Prizes—Silver cups to first and second. (Note—Entrants to this event will be required to enter with regular catalog equipment and carry the full number of passengers.)

Event No. 3—Free-for-all novelty race ($10 entrance fee); unknown distance; entrants to this event will be required to stop their motors in front of the grand stand, crank up and proceed around track, stop in front of grandstand and drive backward for half a lap, etc. Prizes—Silver cups to first and second.

Event No. 4—Five miles for Class C stock (100-125 cubic inches). (Note—Entrants to this event will be required to enter with regular catalog equipment and carry the full number of passengers.)

Event No. 5—Ten mile free-for-all handicap (71-125). Prizes—Silver cups to first and second.

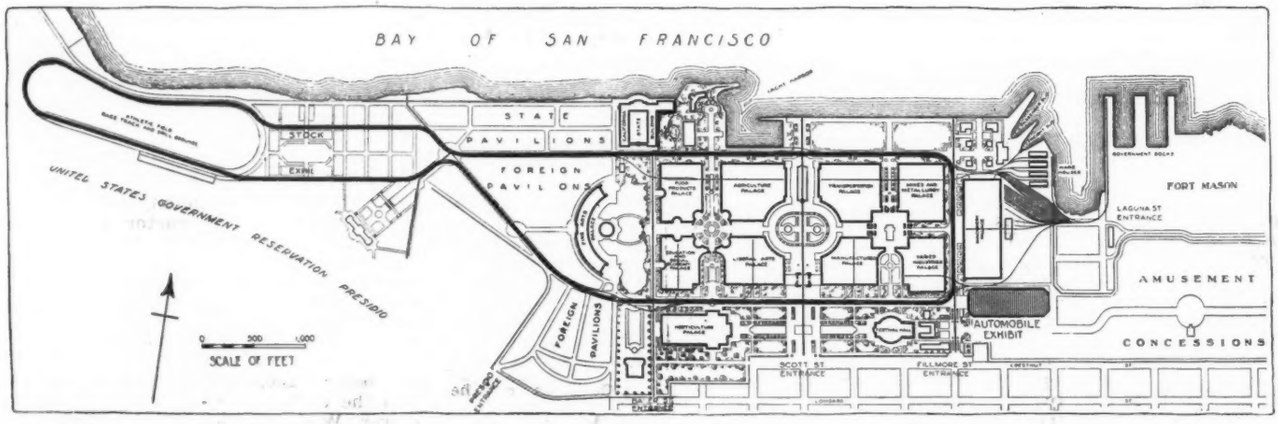
Event No. 6—Five mile handicap for Classes A and B. Prizes—Silver cups to first and second.

Event No. 7—Fifty mile Cyclecar Grand Prix; free-for-all (125 cubic inches limit). Prizes—Cast bronze trophy for first; silver cups to second and third.

Panama-Pacific Wants Vanderbilt Cup

NEW YORK CITY, April 28—A committee of the directors of the Panama-Pacific Exposition has been in this city for some time endeavoring to secure the Vanderbilt Cup Race for the exposition in 1915. The committee has had several interviews with W. K. Vanderbilt, Jr., and reports that the outlook for securing the race is favorable. The directors who are in New York are: W. L. Hughson, of the firm of Hughson & Merton, well-known in the automobile industry on the Pacific Coast; H. P. Scott, of the Union Iron Works; M. H. DeYoung, San Francisco *Chronicle*, and R. A. Crothers, of the *Bulletin*.

The map of the course offered for the race is shown herewith. A definite decision will be reached at a meeting to be held next Monday.



Proposed course for 1915 Vanderbilt at Panama-Pacific Exposition at San Francisco, Cal.

Factory Miscellany

GALION TRUCK PLANT FOR New Co.—Purchasers of bankrupt plant of Cleveland-Galion Motor Truck Co., Galion, O., have taken out a new charter with $100,000 preferred stock, and $150,000 common stock. The company is to be known as the Galion Dynamic Motor Truck Co. W. J. Geer, of Galion, heads new company, which seeks local stock subscriptions. Incorporators, all Galion people, are: G. W. Nickels, N. G. Knight, Charles Schaefer, J. B. Holmes, John J. Bittner, Harry B. Greig and John M. Deibig.

John Brown's New Building — The John Brown Mfg. Co., maker of automobile and carriage lamps, Marion Road, Columbus, O., contemplates building a three-story brick factory addition 100 by 400 feet.

Dominion Chain Will Build—The Dominion Chain Co., Montreal, Que., manufacturer of anti-skid tire chains, is making arrangements to build a factory at Niagara Falls, Ont. W. P. Kearney, Montreal, is general manager.

Kelly-Springfield Adds—The Kelly-Springfield Motor Truck Co., Springfield, O., is planning to erect an addition to its plant on Bart street, which will be 60 by 90 feet. The addition will be used for testing and shipping.

Gramm-Bernstein Enlarges — The Gramm-Bernstein Co., Lima, O., manufacturer of motor trucks, plans to enlarge its plant. A reinforced concrete building, 48 by 110 feet is to be erected at once for the painting and assembling departments.

Racine Body Adds Shop—The Racine Mfg. Co., Racine, Wis., manufacturer of motor car bodies, plans a shop to be used exclusively for the manufacture of bodies. The new building will be four stories, 100 by 281 feet, and will cost $50,000.

Western Tire's $175,000 Plant—The Western Tire & Rubber Co., Regina, Sask., will shortly begin work on a factory to cost $175,000. The company has been capitalized at $1,000,000. W. D. Wilson, of Wilson, Lytle & Badgerow, Ltd., Toronto, is president.

Wishbone Wheel Co. Formed.—Wishbone Auto Steel Wheel Co., Butler, Pa., has been organized with a capital of $100,000, to make a steel wheel for automobiles to do away with rubber tires, the invention of J. W. Carnahan, Washington, D. C., who is president of the company.

McNaull Tire Adds—Erection of new factory will be started by the McNaull Auto Tire Co., Cleveland, O., for the manufacture of tubes, auto accessories and mechanical rubber goods, in addition to the McNaull tire. The site selected is at Miami street, East Side, 700 by 700 feet.

Shipping Thirty Cyclecar Motors Daily.—The Universal Machinery Co., 1916 St. Paul avenue, Milwaukee, Wis., manufacturing the Mack motor for cyclecars. is now shipping from twenty-five to thirty motors daily and will nearly double this quantitv upon the completion of the large works addition now well under way.

The Automobile Calendar

May 1	New Haven, Conn., American Society of Mechanical Engineers, Spring Meeting.
May 2-9	Philadelphia, Pa., Cyclecar Show, Hotel Majestic.
May 2-27	Tulsa, Okla., Ozark Trails Good Roads Convention.
May 5	Chicago, Ill., Section E. V. A. A., Third Annual Meeting, Hotel Sherman.
May 5	New York City, S. A. E., Electrical Equipment Division Meeting.
May 9	Atlanta, Ga., Third Annual Hill Climb, Atlanta Auto & Accessory Assn.
May 12	New York City, S. A. E., Ball and Roller Bearings Division Meeting.
May 14	New York City, S. A. E., Motor Testing Division Meeting.
May 19-20	Boston, Mass., Convention of New England Section of Electric Vehicle Assn. America, Engineers Club.
May 22	New York City, E. V. A. A., New York Section, Consolidated Gas Co. Bldg.
May 23-24	New York City Dealer's Business Demonstration, Motor Dealers Contest Assn.
May 25-26	Palermo, Sicily, Targa Florio, 700-Mile Race.
May 28-30	Chambersburg, Pa., Trys over Lincoln Way from Chambersburg to Pittsburgh, Chambersburg Motor Club.
May 30	Newark, N. J., Cyclecar Run, Newark Cyclecar Club.
May 30	Indianapolis, Ind., 500-Mile Race, Indianapolis Motor Speedway.
June 1	Palermo, Sicily, Coupe Florio, 279-Mile Race.
June 17-18	Fayette Co., Pa., Second Annual Hill Climb, National Pike.
June 18	Uniontown, Pa., Hill Climb, Auto Club of Fayette Co.
June 23-26	S. A. E. Summer Meeting, Cape May, N. J., Cape May Hotel.
June 24-26	Chicago, Ill., Seventh Annual Meeting of Nat. Gas Engine Assn.
June 27-July 4	A. A. A. Touring Week.
June 30	London, Eng., Fourth International Rubber and Allied Industries Congress.
July 3-4	Tacoma, Wash., Montamara Festo Races, Tacoma Speedway Assn.
July 4	Sioux City, Iowa, 300-Mile Race, Sioux City Auto Club and Speedway Assn.
July 4	Lyons, France, French Grand Prix.
July 13-14	Seattle, Wash., Track Races, Seattle Speedway Assn.
July 25-26	Belgium Grand Prix Road Races.
Aug. 21-22	Chicago, Ill., Elgin Road Races, Chicago Automobile Club.
Aug. 23	Auvergne, France, Coupe de l'Auto Race.
Sept. 9	Corona, Cal., Road Race, Corona Auto Assn.
Sept. 26-Oct. 6	Berlin, Germany, Automobile Show.
Oct.	Philadelphia, Pa., E. V. A. A. Annual Convention.
Oct. 9-Nov. 2	S. A. E. Europe Trip.
Oct. 17-24	Pittsburgh, Pa., Automobile Show, Auto Dealers Assn., Inc.
Oct. 19-26	Atlanta, Ga., American Road Congress of the American Highway Assn. and the A. A. A.
Oct. 28-31	Milwaukee, Wis., Convention, Northwestern Road Congress, Auditorium.

Kramer to Manufacture Governors—The Kramer Governor Co., Milwaukee, Wis., incorporated with $100,000 capital, will engage in the manufacture of a governor for gasoline engines as applied to motor vehicles. Benjamin G. Kramer is president and general manager. The concern will occupy the present B. G. Kramer Co. shops at 243 Lake street, Milwaukee.

Bids for the Grout Factory—The receivers of the Grout Automobile Co. at Orange, Mass., have completed their duties and now bids have been asked for the factory buildings. It is expected that they will be sold shortly and converted into some other enterprise and the Grout motor car will be a memory. It was one of the first successful cars on the market.

Ajax Tractor Equipment Sold—The equipment of the Ajax Auto Tractor Co., located near Kenton, a suburb of Portland, Ore., was sold last week to the Smith & Watson Iron Works. The Ajax company was organized by the late W. H. Corbett for the purpose of building gasoline automobile trucks and more than $200,000 was spent in carrying out his ideas.

Racine File Co. Builds—The Racine File Co., Racine, Wis., founded by the late Anthony McAvoy, who also owned the Wisconsin Auto Top Co. of Racine, has been incorporated by the surviving sons, Myron, Charles and Edward McAvoy. The corporation is styled Racine File Co., and the capital stock is $50,000. A new factory building to accommodate both the file works and top and trimming shop will be erected at once.

Tractor Co. Locates—Arrangements have been made by the Morton Plow Co., Galion, O., to have the farm tractors made by the Columbus Machine & Tool Co., Marion Road, Columbus. The officers of the company looked around for several weeks to secure a location for the factory and finally a contract was made with the Columbus concern. The tractor is operated by a gasoline engine and carries a gang of three plows.

New Automobile Factory—The Crescent Motor Car Co. has been organized to manufacture several types of popular price automobiles. Crescent will be the trade title. George A. Root is president of the company; Albert G. Nulsen, Jr., vice-president; William H. Foster, secretary and treasurer, and Edward L. Beebe, counsel. Every St. Louis automobile factory is flourishing, and the new plant undoubtedly has a bright future.

Tractors Co. Will Add—The Killen-Strait Mfg. Co., Appleton, Wis., manufacturing the Strait tractor and other power-driven machinery, is about to make additions and enlargements which will make possible the production of about ten tractors per week. The company is a reorganization of the Killen-Walsh Mfg. Co., and several weeks ago was reincorporated, the authorized capital being $200,000. The concern occupies the entire group of the old Double Power Windmill Co. at Appleton. A battery of six milling machines, lathes and drills is being installed.

The Week in the Industry

Motor Men in New Roles

WILCOX Succeeds Pettit—The Commerce Motor Car Co. has appointed George D. Wilcox sales manager to succeed W. S. Pettit, resigned. Mr. Wilcox was formerly sales manager of the Regal Motor Car Co. and later held the same position with the Standard Motor Truck Co.

Armstrong Made Manager—G. D. Armstrong has been made manager of the motor truck department of the Brasher Motor Car Co., Fourth and Gay streets, Columbus, O.

Hawley Boston King Manager—P. E. Hawley has been appointed manager of the New England agency of the King Motor Car Co., of Detroit, with headquarters at 1008 Boylston street, Boston, Mass.

Gilson With L. P. C. Co.—J. W. Gilson, who for several years was connected with the Mitchell Lewis Motor Co., is now associated with the L. P. C. Motor Co., Racine, Wis., as advertising and publicity manager.

Vining Is Sales Manager—R. W. Vining has been placed in charge of the retail sales of the Oakland Motor Car Co., Boston, Mass., by L. B. Saunders, who has been appointed manager of the branch by the factory.

Manion Comet Sales Manager—J. H. Manion, who was formerly with the R. C. H. Corp., but more recently with the Brown Commercial Car Co., has been appointed sales manager for the Comet Cyclecar Co., Indianapolis, Ind.

Meers in New Capacity—I. M. Meers, foreign sales manager of the Empire Motor Car Co., Indianapolis, has become assistant sales manager of the King Motor Car Co. The King company is laying its plans for a rousing sales convention of all of its dealers early in June in this city.

Clay Promoted—W. G. Clay, for the past 5 months in the sales department of the Chandler Motor Car Co., Cleveland, O., has been promoted to assistant sales manager as first lieutenant to C. A. Emise. Mr. Clay was formerly with the Briscoe Mfg. Co., Detroit, and prior to that was connected with Stoddard-Dayton Co.

Fenton Marmon Advertising Manager—The Nordyke & Marmon Co., Indianapolis, Ind., has announced the appointment of Howard Fenton as advertising manager. Mr. Fenton formerly was with the Remy Electric Co., Anderson, Ind., but more recently has been the representative in Indianapolis and vicinity of *Automobile Topics*.

Brown Indiana Legislature Candidate—Capt. Will H. Brown has formally announced he will be a candidate for the Republican nomination from Indianapolis for representative in the Indiana Legislature. Capt. Brown is with the Cole Motor Car Co., president of the Brown Commercial Car Co. and recently was appointed a captain in the Indiana National Guard by executive order of Governor Samuel M. Ralston.

Bates Makes Shift—G. J. Bates, who has been at the head of the pneumatic sales of the Firestone Tire & Rubber Co. at the Akron headquarters during the past year, is now looking after the company's pneumatic tire interests among the automobile factories in Detroit and throughout Michigan. Mr. Bates makes his headquarters at the Firestone Detroit branch, corner Canfield and Woodward avenues.

Mooney Takes Neighbors Job—Following the announcement made recently by President J. Walter Drake, of the Hupp Motor Car Co., Detroit, Mich., that Sales Manager R. G. Neighbors had relinquished that position after several seasons of successful executive work, to enter another field, comes the news that Frank J. Mooney, for several years advertising manager of the company, has been appointed to handle both the sales as well as the advertising.

Humphreville Comes to N. Y. City—A. H. Humphreville, of Newark, N. J., has been appointed manager in charge of the distribution of Jeffery cars in New York City. He becomes manager of the Stratton Auto Sales Co., of which Gilbert M. Stratton is president, according to announcement made by E. S. Jordan, sales manager for the Jeffery company. Handling the Jeffery make is nothing new to Humphreville as his company, the Newton-Humphreville Company in Newark sells Jeffery cars exclusively in that district.

Gordon Joins Century—W. J. Gordon, for twelve years associated with the Anderson Electric Car Co., and manager of the Detroit branches of that company, has been appointed general manager of the Century Electric Car Co. Mr. Gordon is also treasurer of the Detroit Automobile Dealers' Assn. A. H. Dorsey, of Toronto, succeeds Mr. Gordon as manager of the city sales and service stations, having been for many years with an automobile agency in Boston and later with the Ontario Motor Car Co., Toronto.

Lozier Agency Changes—The Bekins-Speers Motor Co., Los Angeles, Cal., recently celebrated its third year in business and also as distributor of Lozier cars in southern California. H. H. Coffman, formerly sales manager, has been promoted to take charge of the Los Angeles office. Mr. Speers will hereafter devote his entire time to the wholesale work throughout California, Nevada and Arizona, while M. E. Bekins, secretary and treasurer of the corporation, will devote himself to the financial end of the organization and keep headquarters in San Francisco.

Helfer Joins Jeffery-Dewitt—W. T. Helfer, who has been prominently connected with the motor-car industry for the past 16 years, has accepted the position of sales manager for the Jeffery-Dewitt Co., Detroit, Mich., manufacturer of spark plugs and spark-plug porcelains. Mr. Helfer made his first entry into the automobile business back in 1898, as New England manager for the Diamond Rubber Co., with headquarters in Boston. After 8 years he left the Diamond and went with the Springfield Body Co., of Springfield, Mass., remaining for 4 years and then associating himself as sales manager with the Racine Mfg. Co., of Racine, Wis.

Garage and Dealers' Field

Vacuum Oil Co.'s New Offices—The Vacuum Oil Co. is moving into its new offices on the sixteenth and seventeenth floors of the new Adams Express Building at 61 Broadway, New York.

New Miller Branch Opened—The new home of the Miller Rubber Co.'s Los Angeles branch at Pico and Hope streets, is completed. This new branch will be under the direction of Walter Sahland.

Automobile Requisites at Wholesale—An association is being formed in Ottawa, Ont., to be known as the Dominion Auto Supply League, which will have as its object the supplying of automobile requisites to its members at wholesale prices. An office will be opened on Bank street shortly. Forty auto owners have already signified their intention of joining. The league will be conducted along much the same lines as the Automobile Owners' Assn. of Toronto, which has some 3,000 members.

Link-Belt Office in Detroit—The Link-Belt Co., Chicago, Ill., manufacturer of the Link-Belt silent chain drive for the transmission of power, etc., has opened an office in Detroit, Mich., room 911, Dime Bank Bldg. L. W. Longan, formerly connected with Chicago and Indianapolis works of the company, has been placed in charge.

Motor Hearses Barred—One of the lower courts of Boston heard a case rather unique a few days ago when the driver of a motor hearse returning from a funeral was brought into court for violating the metropolitan park ordinances. He was charged with operating a business vehicle on the boulevards, which are restricted for pleasure vehicles. The judge ruled that the hearse was not a pleasure vehicle and so the driver was adjudged guilty and fined.

Help Toward Railroad Crossing Safety—A piece of red glass has made it possible to use red lights on railroad crossing gates, and add greatly to the safety of motorists and other drivers at grade crossings. This has never been possible before for fear of confusing engineers on passing trains, but a simple device worked out in the signal department of the Lehigh Valley Railroad has made feasible the adopting of red lights at every grade crossing in the country. The ordinary crossing gate has a white light hung to the bar, which at night indicates by its position alone whether the track is clear. But by this device a piece of red glass set in a roundel, as in a frame, is fastened to the bar so that the white light swings behind it and shows red when the gate is down. When the gate is up, as the roundel is stationary and the light swings, the light comes out from behind the red glass and shows white again.

Automobile Agencies Recently Established

PASSENGER CARS

Place	Car	Agent
Albuquerque, N. M.	Oakland	Inter State Auto Co.
Allentown, Pa.	Moon	W. F. Rabenold & Co.
Alton, Ill.	Hudson	H. M. Schweppe
Ardmore, Pa.	Oakland	Wirt Franklin
Arkansas City, Kan.	Haynes	Collison Bros.
Auburn, N. Y.	Moon	Moon Garage
Austin, Ill.	Moon	G. W. Beach Auto Co.
Austin, Tex.	Moon	Abadies Garage
Babina, O.	Oakland	L. E. Whinery
Beaver Crossing, Nebr.	Oakland	V. D. Johnston
Beloit, Kan.	Chandler	Johnson & Mularkey
Berlin, Wis.	Haynes	E. C. Deibler
Bode, Ia.	Oakland	A. M. Anderson & Co.
Booneville, Mo.	Hudson	Henry Efinger
Boston, Mass.	Marion	N. H. Halliday
Boston, Mass.	Westcott	Westcott Motor Car Co. of Boston
Bradgate, Ia.	Oakland	P. H. Barger & Co.
Brockton, Mass.	Westcott	W. H. Marble
Brookfield, Mo.	Moon	Barabee & Carter
Brookfield, Vt.	Oakland	Dickinson Motor Co.
Buffalo, Kan.	Empire	C. E. Miller
Buffalo, Kan.	Pathfinder	C. E. Miller
Cairo, Ill.	Hudson	A. D. Teer
Caney, Kan.	Empire	H. E. Truskett
Caney, Kan.	Pathfinder	H. E. Truskett
Cape Girardeau, Mo.	Hudson	Fred A. Groves
Canton, O.	Haynes	Knoedler Motor Co.
Canyon, Tex.	Moon	Grundy & Guthrie
Cape Girardeau, Mo.	Coey	J. W. Brownstein
Centralia, Ill.	Hudson	C. P. Glore
Champaign, Ill.	Westcott	W. H. Miller
Chateaugay, N. Y.	Oakland	Humphrey-Hyland Co.
Chicago, Ill.	Haynes	E. E. Fulton Co.
Circleville, O.	Little Giant	I. P. Todd
Columbus, Kan.	Empire	D. E. Heter
Columbus, Kan.	Pathfinder	D. E. Heter
Columbus, O.	Herreshoff	Herreshoff Motor Co.
Colorado Springs, Col.	Moon	C. S. Wolff & Co.
Craig, Mo.	Empire	L. J. Strickler
Craig, Mo.	Pathfinder	L. J. Strickler
Cynthiana, Ky.	Oakland	J. F. Davied
Dallas, Tex.	Moon	Davis-Turney Auto Co.
Dawson Spgs., Ky.	Oakland	J. E. Hayes
Des Moines, Ia.	Moon	Means Auto Co.
Dewey, Okla.	King	Pope Garage Co.
Dorchester, Mass.	Oakland	Proctor Bros.
Dunlap, Ia.	Oakland	Probasco Auto Co.
E. Meredith, N. Y.	Herreshoff	Menzo Tobey
Ebersonville, Mo.	King	S. E. Cook
Ft. Dodge, Ia.	Haynes	Haynes Auto Sales Co.
Frankfort, Ind.	Haynes	M. B. Fisher
Gardiner, Kan.	King	J. M. Anderson
Gloversville, N. Y.	Haynes	Chas. E. Lair
Green Bay, Wis.	Moon	Meyer Auto Co.
Guthrie, Okla.	Oakland	F. A. Erixon
Hamburg, Pa.	Moon	Central Garage
Hamilton, O.	Westcott	Carr & Baxter
Hastings, Ia.	Haynes	Clarence Sandiland
Herculaneum, Mo.	Hudson	J. D. DeBuchanne
Hibbing, Minn.	Hupmobile	Chas. Wenberg
Hillsboro, Ill.	Hudson	McDavid Auto Co.
Houma, La.	Hupmobile	Dr. J. W. Warren
Huntington, Ind.	Pilot	D. E. Lauferty
Huntsville, Ala.	Moon	O. M. Graham
Indiana, Pa.	Pilot	J. L. Culp
Jacksonville, Ill.	Haynes	Andre & Andre
Jacksonville, Ill.	Hupmobile	William Newman
Jersey Shore, Pa.	Pilot	R. M. Sallada
Kane, Pa.	Pilot	G. E. Glatt
Kankakee, Ill.	Haynes	D. L. Hogan
Kendalville, Ind.	Moon	Waterhouse & Walters
Knoxville, Ia.	Oakland	Goff & Roberts
Kokomo, Ind.	Pilot	Edward Neary
Lafayette, Ind.	Haynes	Patterson Gar. Co.
Las Cruces, N. M.	Haynes	Jas. Cox
Lawrence, Kan.	Moon	E. L. Charlton
Leavenworth, Kan.	Haynes	Robert Keller
Lebanon, Ky.	Metz	I. L. Canary
Lima, O.	Royal Ohio	Chas. Fenner
Lima, O.	Saxon	Mack Garage
Lima, O.	Moon	H. L. Sherrick & Co.
Little Rock, Ark.	Moon	E. N. Pettit Auto Co.
Little Rock, Ark.	Pilot	Joseph Brown
Los Angeles, Cal.	Pilot	Wilshire Auto Co.
Louisville, Ky.	Saxon	H. D. Bowman
Lyons, Neb.	Oakland	Samuel Shaw & Sons
Madelia, Minn.	Moon	J. J. Bill
Marshall, Mo.	Haynes	Brown McAmis & Son
Marshall, Mo.	Haynes	McAnnus & Son
Masontown, Pa.	Pilot	Masontown M. C. Co.
Mattese, Mo.	Pathfinder	Aug. Kassebaum
McKeesport, Pa.	Pilot	T. J. Ardinger
Memphis, Tenn.	Moon	MacDonald Auto Co.
Menno, S. D.	Hupmobile	E. J. Decker
Missoula, Mont.	Haynes	J. W. Kirshman
Moberly, Mo.	King	C. L. Leitch
Mondamin, Ia.	Hupmobile	G. W. Coffman
Monon, Ind.	Pilot	H. B. Tull.
Monroe, N. C.	Hupmobile	Henerdson Gar. & M. Co.
Monroe, Wis.	Haynes	Bear & Jaberg
Montrose, Col.	Pilot	John Hodges
Morgan City, La.	Hupmobile	Morgan City Auto Co.
Murphysboro, Ill.	Pilot	G. E. Crane
Naperville, Ill.	Moon	Naperville Garage
Nashville, Tenn.	Moon	John H. Lawrence & Sons
Needham, Mass.	Imp	C. F. Roberts
Newark, O.	Ford	Hess Auto Co.
Newark, O.	Overland	F. W. Simpson
Newark, O.	Regal	Fred Reigger
Niles, Mich.	Oakland	R. M. Chase
Norfolk, Va.	Pilot	C. B. Cole
Northwood, Ia.	Oakland	I. O. Kaasa
Olathe, Kan.	Moon	H. H. Case & Co.
Olathe, Kan.	King	N. F. Dunn
Oswego, N. Y.	Pilot	E. E. Favreau
Owaneco, Ill.	Hupmobile	Tex Bros.
Owensville, Mo.	Metz	J. H. Kormeier
Parker, S. D.	Hupmobile	H. M. Danforth
Peru, Ind.	Pilot	J. L. McClure
Philadelphia, Pa.	Pilot	Raymond McCormick
Phoenix, Ariz.	Saxon	Creed L. Fauber
Piedmont, Mo.	Auburn	C. E. Wayland
Piqua, O.	Haynes	R. E. Jackson
Pittsburgh, Pa.	Kisselkar	Hiland Auto Co.
Pittsburgh, Pa.	Pilot	Schott & Albrecht
Plainfield, N. J.	Chandler	E. & C. Auto Co.
Plainview, Tex.	Pilot	W. C. Wright
Plankington, S. D.	Hupmobile	Frank Boho
Platte, S. D.	Hupmobile	R. M. Girten
Platte Center, Neb.	Maxwell	Platte Center Auto Co.
Plattsmouth, Neb.	Hudson	P. T. Becker
Plentywood, Mont.	Maxwell	Steele & Lewis
Plymouth, Wis.	Ford	Deicher & Arndt Co.
Plymouth, Wis.	Jeffery	Deicher & Arndt Co.
Ponce, Neb.	Hupmobile	A. H. Hilles
Portland, Pa.	Pilot	E. B. Bogert
Poughkeepsie, N. Y.	Maxwell	Cole Motor Co.
Pontiac, Mich.	Maxwell	G. G. Burt
Providence, R. I.	Pilot	H. E. Bradford
Price, Utah	Maxwell	Price Auto & Stage Co.
Providence, R. I.	Haynes	Richard G. Davis
Raymond, Ia.	Pilot	P. J. O'Connor
Rayne, La.	Haynes	Stamm-Scheele Mfg. Co.
Reading, Pa.	Moon	Crawford Auto Sales Co.
Red Bank, N. J.	Hupmobile	F. R. Boice & Co.
Red Oak, Ia.	Jeffery	C. R. Rumsey
Red Wood Falls, Minn.	Moon	J. A. White Auto Co.
Remson, Ia.	Hupmobile	Eichorn & Willenburg
Rice Lake, Wis.	Maxwell	Crisler & Co.
Rich Square, N. C.	Hupmobile	Holoman Bros.
Richmond, Ind.	Pilot	McConaha Co.
Riley, Kan.	Empire	W. S. Sylvester
Riley, Kan.	Pathfinder	W. S. Sylvester
Rochester, N. Y.	Pilot	Almy Auto Co.
Rockford, Ill.	Chandler	Edward Troller
Rocky Mount, N. C.	Maxwell	Dixie Garage Co.
Roxboro, N. C.	Maxwell	T. J. Hatchett
Salida, Col.	Moon	W. H. French Auto Co.
Samson, Ala.	Maxwell	Morris & Holloway
San Antonio, Tex.	Westcott	C. H. Dean
San Francisco, Cal.	Herreshoff	Stott-Strugnell Co.
San Francisco, Cal.	Pilot	Mission Garage
San Pedro, Cal.	Hupmobile	Leslie Straight
Santa Fe, N. M.	Pilot	Nathan Salmon
Santa Rosa, N. M.	Hupmobile	Nusome & Nuckles
Saratoga, N. Y.	Chandler	Central Auto Sales Co.
Savanna, Ill.	Kisselkar	A. D. Shaw
Schuyler, Neb.	Chalmers	A. J. Grier
Schuyler, Neb.	Saxon	A. J. Grier
Scottsbluff, Neb.	Chalmers	Sams & McCaffery
Seattle, Wash.	Kisselkar	Northwest Kisselkar Co.
Seattle, Wash.	Haynes	N. J. Morehouse
Sharon, Pa.	Hupmobile	Mercer Co. Auto Co.
Shawano, Wis.	Kisselkar	Schweers Hdw. Co
Shelby, N. C.	Hupmobile	Chas. L. Eskridge
Sibley, Ia.	Hupmobile	Pulscher Bilders & Co.
Sikeston, Mo.	Hupmobile	Lancaster, Keller & Co.
Silver City, Neb.	Jeffery	J. H. Peterson
Silver City, N. M.	Monarch	Will Rowlee
Skidmore, Mo.	Oakland	C. E. Groves
Skylight, Ky.	Oakland	W. M. Clore
Socorro, N. M.	Maxwell	T. F. Gibbons
South Bend, Ind.	Moon	L. W. McGann
South Boston, Va.	Oakland	Ballow Motor Co.
Spooner, Wis.	Maxwell	F. W. Webster
Springfield, Mo.	Chandler	J. E. Atkinson
Springfield, Mass.	Moon	Chesebro & Schrenskeisen
Springfield, O.	Westcott	Eaton Motor Service Co.
Springvale, Me.	Kisselkar	E. E. Wentworth
St. Charles, Mo.	Chase	Ring & Barklage
St. Joseph, Mo.	White	E. C. Eads Auto Co.
St. Johnsbury, Vt.	Maxwell	Hunt & Lawson
St. Joseph, Mo.	Maxwell	J. H. Van Brunt
St. Louis, Mo.	Westcott	Automobile Clearing House
Stamford, Conn.	Maxwell	Bell Bros.
Stantonsburg, N. C.	Maxwell	Bagley Motor Co.
Stanton, Ia.	Maxwell	Stanton Implement & Auto Co.
State College, Pa.	Pilot	M. B. Meyer
Sterling, Ill.	Kisselkar	Wm. Dieterlie
Sterling, O.	Oakland	Roy Baxter
Sterling, Col.	Maxwell	Ideal Auto & Mach. Co.
Streeter, Tex.	Maxwell	F. B. McCollum
Stuart, Ia.	Oakland	Dan Pote
Summit, N. J.	Maxwell	E. F. Anderson
Superior, Wis.	Hupmobile	Superior Door & Catch Co.
Sutherland, O.	Hupmobile	Earl Hondo
Sycamore, Ill.	Haynes	J. H. Montgomery
Syracuse, Neb.	Oakland	Jas. Eaton
Syracuse, N. Y.	Maxwell	Onondaga Motor Co.
Taconite, Minn.	Maxwell	Hope & Dolezel
Tallahassee, Fla.	Hupmobile	Messer & McDougall
Tamaqua, Pa.	Pilot	Henry Becker
Tarkio, Mo.	White	G. G. Volker
Taylorville, Ill.	Oakland	John Anderson
Texarkana, Tex.	Hupmobile	F. E. Baxter
Thomasville, N. C.	Hupmobile	C. F. Finch
Thomson, Ill.	Kisselkar	F. E. Lewis
Three Rivers, Mich.	Moon	J. W. Godschalk
Thurman, Ia.	Studebaker	Thurman M. C. Co.
Tillamook, Ore.	Maxwell	J. F. Hiner
Tipton, Ind.	Pilot	F. U. Campbell
Topeka, Kan.	Empire	Seery & Morton
Topeka Kan.	Hudson	H. H. Clark
Topeka, Kan.	King	W. T. Dawson Auto Co.
Topeka, Kan.	Moon	Richmond Auto Co.
Topeka, Kan.	Pathfinder	Seery & Morton
Torrington, Conn.	Pilot	J. E. Mallett
Trinidad, Col.	Pilot	C. E. Carter
Trinity, Tex.	Maxwell	B. Schultz
Troy, Kan.	Packard	Strong Motor Co.
Tulsa, Okla.	King	William & Stacys
Tyndall, S. D.	Hupmobile	O'Brien & Gretshman
Utica, Minn.	Chandler	R. D. Ouden
Valier, Mont.	Chandler	W. L. Campbell
Vandalia, Ill.	Stearns	F. C. Eckard
Van Meter, Ia.	Maxwell	A. J. Stump
Venice, Ill.	National	E. W. Schildman
Venus, Tex.	Hupmobile	R. S. Morris
Villisca, Ia.	Hudson	Tice & Evans
Wakefield, Neb.	Hupmobile	C. A. Samuelson
Wallingford, Ia.	Oakland	J. O. Kaasa
Waldwick, N. J.	Hupmobile	F. E. Weygant
Warren, Minn.	Franklin	R. M. Gilbert
Warrensburg, Mo.	Packard	Estes Garage
Wasela, Minn.	Moon	Dr. Lynn Garage
Washington, D. C.	Car-Nation	International Motor Co.
Washington, D. C.	Briscoe	Probey-Haynes Motor Co.
Washington, D. C.	Cole	Cole Motor Sales Co.
Washington, D. C.	Westcott	Probey-Haynes Motor Co.
Washington, Mo.	Auburn	L. H. Schroeder
Washington, D. C.	Reo	H. V. Lansdale
Washington, Ind.	Haynes	Hatfield & Palmer Co.
Washington Ia.	Pilot	J. E. Griffith
Washington C.H.	O. Westcott	Moore & Jamison
Watertown, N. Y.	Chandler	Edwards Auto Co.
Watertown, S. D.	Kisselkar	Wolf Auto Co.
Watson, Ill.	Maxwell	W. H. Jaycox
Waupun, Wis.	Haynes	Meiklejohn & Butts Auto Co.
Wauseon, O.	Hudson	Conway & Brown
Wauseon, O.	Overland	Conway & Brown
Waverly Hall, Ga.	Maxwell	Moultrie & Stanford
Wayne, Neb.	Hupmobile	Johnson & Williamson
Weimar, Tex.	Maxwell	C. H. Potthast
W. Alexandria, O.	Oakland	Jesse I. Rhodes
West Bend, Ia.	Oakland	Elmer H. Benckendorf
West Salem, O.	Oakland	Smalley Auto Co.
Western, Neb.	Oakland	Holcombe Auto Co.
Westside, Ia.	Jeffery	Peterson & Campbell
Wheatland, Ia.	Kisselkar	Witte Bros.
Whitehouse, N. J.	Hupmobile	Burdette Bros.
White Earth, Minn.	Hupmobile	Geo. McLean
White Stone, Va.	Hupmobile	C. W. Hubbard
White Plains, N. Y.	Pilot	F. H. Briggs
Whitesboro, N. Y.	Pilot	J. H. Owens & Son
Whiting, Ia.	Hupmobile	A. B. Elliot
Wichita, Kan.	Lozier	Moriarity Motor Co.
Wilkinsburg, Pa.	Pilot	Clyde R. Gilchrest
Wildrose, N. D.	Maxwell	Tangen & Taylor
Willow Shade, Ky.	Maxwell	O. P. Harvey
Wilmington, Del.	Maxwell	Edward Krause
Wilmington, N. C.	Hupmobile	S. G. MacMillan
Wilmington, N. C.	Moon	J. B. Farmer & Co.
Wilmington, O.	Oakland	Dorsey Wolgamuth
Wilmore, Ky.	Maxwell	H. E. Fisher
Winchester, O.	Ford	W. H. Orebaugh
Winfield, Kan.	Haynes	Collison Bros.
Winfield, Ia.	Moon	Nesbitt Auto & Supply Co.
Winnebago, Neb.	Hupmobile	John Ashford
Wrightstown, Wis.	Maxwell	Joseph Kauthramer
Yonkers, N. Y.	Haynes	Harold D. Van Derlyn
Yonkers, N. Y.	Hupmobile	H. D. Vanderlyn
Youngstown, O.	Chandler	J. Ralph Seidner
Youngstown, O.	Paige Detroit	Standard Auto Sales Co.
York, Pa.	Oakland	W. Arch Miller
York, Pa.	Studebaker	G. Edward Swartz
Xenia, O.	Buick	Xenia Taxicab Co.
Zanesville, O.	Westcott	Price Import Co.
Zearing, Ia.	Maxwell	Eagle Auto Co.

COMMERCIAL VEHICLES

Place	Car	Agent
Bellflower, Mo.	Wahl	E. S. Mentze
Boston, Mass.	Mais	U. S. Mill Supply Co.
Franklin, Ky.	Koehler	Franklin Hdw. Co
Harrisburg, Pa.	Koehler	P. D. Messner
Hazleton, Pa.	Koehler	W. R. Rittenhouse
Louisville, Ky.	Commerce	Peter M. Andriot & Sons
Manchester, N. H.	Koehler	Hanover St. Garage
Wright City, Mo.	Wahl	E. S. Mentze

CYCLECARS

Place	Car	Agent
Berkeley, Cal.	Imp	Janes & Hunt M.C.Co.
Fitchburg, Mass.	Imp	N. E. Goodwin
Hackensack, N. J.	Imp	T. Blackmore
Hannibal, Mo.	Imp	Hannibal Auto Co.
Lowell, Mass.	Imp	H. N. Randall
Newark, O.	Imp	F. E. Reiger
New Haven, Conn.	Imp	James McLay
Ottawa, Kan.	Imp	Albert Jewett
Philadelphia, Pa.	Pioneer	W. F. Rudolph
St. Louis, Mo.	Scripps-Booth	Cyclecar Sales Co.
Tacoma, Wash.	Imp	J. E. Jones
Washington, D. C.	Dudley	Original Cyclecar Co.

ELECTRIC VEHICLES

Place	Car	Agent
Aurora, Mo.	Baker	T. E. Clark
Booneville, Mo.	Baker	O. H. Stephens
Brunswick, Mo.	Baker	Halliburton Bros. Gar
Carrollton, Mo.	Baker	Wright Bros.
California, Mo.	Baker	H. & W Kuhlmans
Clinton, Mo.	Baker	Industrial Iron Wks.
Eldorado Spgs., Mo.	Baker	C. M. Mason Auto Co.
Emporia, Kan.	Baker	Newton Bros.
Excelsior Spgs., Mo.	Baker	Elms Gar. & Auto Co.
Garnett, Kan.	Baker	Garnett Garage
Greenfield, Mo.	Baker	J. E. Shaw
Hiawatha, Kan.	Baker	M. & K. Auto Co.
Holton, Kan.	Baker	Holton Auto Co.
Independence, Kan.	Baker	J. F. Daniels
Iola, Kan.	Baker	J. B. Kirk
Kirksville, Mo.	Baker	Carder Auto Co.
Lamar, Mo.	Baker	Pacific Garage
Lexington, Mo.	Baker	Santa Fe Trail Garage

WARD LEONARD Cyclecar Generator—Appreciating that small cars in general and cyclecars in particular have a lamp load of not more than 5 amperes, the Ward Leonard Electric Co., Bronxville, N. Y., has developed a special lighting system for this trade. It is identical in its construction and method of operation with the larger outfits used on big cars which demand a lamp load of nearly 10 amperes.

The dynamo, Fig. 1, gives 6 amperes at 1,800 revolutions per minute, weighs less than 9 pounds and is less than 5 inches long.

The controller for the dynamo is a separate, constant-ampere type light in weight and small in size. This controller also embodies the switch.

The constant ampere control system has the advantage, it is stated, that a smaller charging battery is required than with the variable system.

Ward Leonard Overrunning Clutch—A positive clutch for starter or generator drive has just been put on the market by the Ward Leonard Electric Co., Bronxville, N. Y.

In Fig. 2 it is shown mounted in a spur gear. In one member of the clutch are four dogs or blocks that are pressed inward by springs and in the other member there are seven notches. Only one dog can be engaged at a time, but one-twentieth of a revolution will result in the engagement of the clutch.

When the drive is in the reverse direction, the dogs are forced out of engagement by the inclined surface of the back of the cam and once out of engagement the dogs are held in this position by centrifugal force, providing the speed is over 100 revolutions per minute. Thus there is no wear between the clutch members as the dogs do not rub against the cam teeth under ordinary conditions.

Ely Shock Absorber—The spring shock absorber, Fig. 3, made by the Donnelly Motor Equipment for Ford cars exclusively, has recently been changed so that now the cap is made in two pieces instead of one as formerly. This makes the instrument more accessible for adjustment or for greasing and also adds to the appearance as the top half of this casing is now made of brass instead of steel.

As was described in the Feb. 12 issue of THE AUTOMOBILE this shock absorber is an auxiliary spring type in which a special form of swivel joint is employed by which the shock absorber is maintained in a vertical position at all times.

As the weight of Ford cars varies with the amount of accessories placed upon them an adjustment is provided to compensate for varying loads. The price per set of four is $12.50 and per pair $7.50.

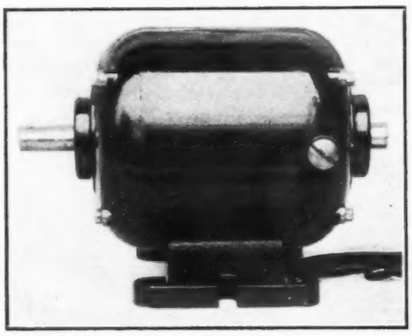


Fig. 1—Ward Leonard cyclecar lighting generator

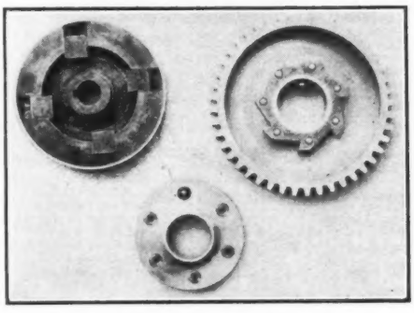


Fig. 2—Ward Leonard overrunning clutch

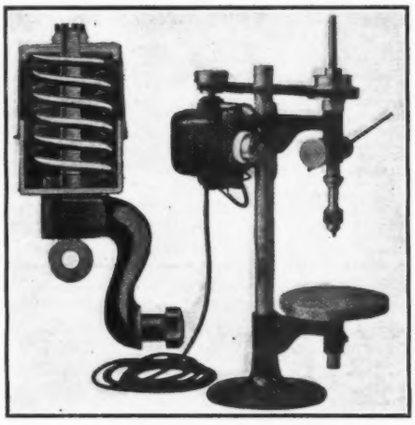


Fig. 3—Left—Ely shock absorber
Fig. 4—Right—Portable drill press

Portable Drill Press—F. W. Lieberknecht & Co. is making a portable electric drill press, Fig. 4, which is designed to save time for the repairman, as it enables the tool to be taken to the work instead of bringing the work to the tool, as is ordinarily done. It can be run from any lamp socket and may be placed on the floor or on a bench. It consumes .02 kilowatt per hour, and it is said that this low consumption results in a great saving, especially as there is no line shafting loss, as is often the case when a large stationary drill press is used. The wear of the rack and pinion can be adjusted. The platen will turn about its center and upon the upright column while the depth of the hole can be adjusted by a micrometer screw. The drill press can be set directly on the work when desired.

Portable Electric Saw Table—F. W. Lieberknecht & Co., Brookline, Mass., is making a portable electric saw table that is a labor saver where much woodworking is done. It is operated by a small electric motor which can be connected up to any lamp socket, the motor consuming .25 kilowatt per hour.

Security Auto Lock—An ingenious gasoline lock is made by the Security Auto Lock Co., 1733 Broadway, New York City. As indicated by the illustration, Fig. 5, the lock consists of four plug cocks arranged in a row. All four of these must be turned on before gasoline can flow.

The Security lock can be installed on the floor board or chassis frame when gravity feed is used, while with pressure feed the lock may be placed on the dash. The price is $7.50.

Brown Master Vibrator for Fords—A new master vibrator for Ford cars has been announced by the Brown Co., Syracuse, N. Y. One of the strongest features claimed for it is that it has a purely mechanical adjustment which may be made by a novice in a moment's notice.

It is stated that the contacts will not stick and never need to be removed due to the fact that they are separated by a sharp blow instead of being drawn apart and they are made of specially hardened material.

The master vibrator takes the place of separate vibrators and thus supplies uniform sparks to all cylinders, insuring a smooth running motor.

The device is mounted in a mahogany dash case equipped with a substantial kick switch. It can be attached to the dash and is interposed between the source of current and the coil. The switch handle may be removed so that the car cannot be stolen.

Ford Lock—A simple locking device that is so constructed that it holds the gear pedals on the Ford car in neutral position is made by the Ford Lock Co., 1046 South Olive street, Los Angeles,

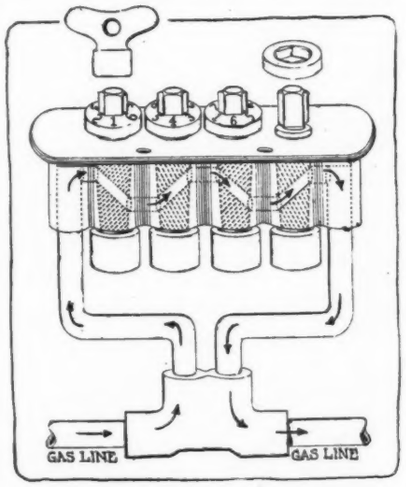


Fig. 5—Security Auto Lock cuts off fuel

Cal. It consists of a hardened steel plate that is padlocked in position around the pedals and effectually prevents the use of the gears, yet it does not interfere with the releasing of the brake. Therefore the car can be pushed around the garage, yet cannot be driven. The price is $1.

Holmes Repair Truck—A simple device, designed for bringing in crippled automobiles is made by Robt. Holmes & Bros., Danville, Ill. The frame of the truck is pivoted and arranged to work like a caster and is adjustable to fit any axle, front or rear. The tongue of the truck is made of second growth hickory and is well ironed on the butt end so that it can be used in lifting a disabled machine.

The truck is intended to be used under the rear axle, when the machine is entirely disabled, the tongue extending under the front axle where it is tied. If one of the front wheels is damaged the truck is attached by reversing the position of the frame, the end of the tongue being tied to the rear axle.

The wheels, frame and axle rest are made of heavy malleable castings and the wheels turn on Hyatt roller bearings.

J. H. Tonneau Shield—Believing that it is just as important to afford protection from dust and wind to the passengers occupying the rear seat of an automobile as the front the Mutual Auto Accessories Co., 60 West 65th street, is introducing the J. H. Tonneau shield, Fig. 6. It is made in sizes to fit any car and is finished in mahogany, nickeled or brass frames. When not in use, it can be folded up against the back of the front seat. The movement of passengers in and out of the car is not interfered with as the shield can be pushed out of the way. It sells for $60.

Miller Sectional Garages—A large variety of sectional garages are produced by the Miller Mfg. Co., 8000 Alabama avenue, St. Louis, Mo. They vary in size from 12 by 12 to 16 by 24 feet, and in price from $68 to $162, without flooring, and from $86.70 to $212, with flooring.

Each garage is furnished complete, in sections, and can be bolted together without difficulty by any one. All hardware, sash and bolts that permanently bind the garage together are put in place as part of the equipment. One design is shown in Fig. 7.

Prentiss Cooking Outfits—All steel kitchenettes for four and six people and folding gasoline stoves and ranges for the automobilist are made by the Prentiss Mfg. Co., Racine, Wis., and are designed to be carried on the running board.

The six party kitchenette is shown in Fig. 8. It contains a full set of dishes for six people, with the necessary knives, forks and spoons, and in addition containers for coffee, sugar, flour, salt and pepper, coffee pot and cooking utensils. The dishes are made from white enameled ware.

The case measures 17.5 inches high by 28 inches long by 12 inches wide. The weight, uncrated, is 75 pounds, and the price $37.50, while the price of the four party outfit is $26.

The folding stoves have three burners, two for cooking and one for the oven, the latter folding out of the way when not in use.

New-Lite Electric Lighting Plant—A complete electric lighting system, Fig. 9, that is suitable for installation on small cars such as the Ford, Metz and

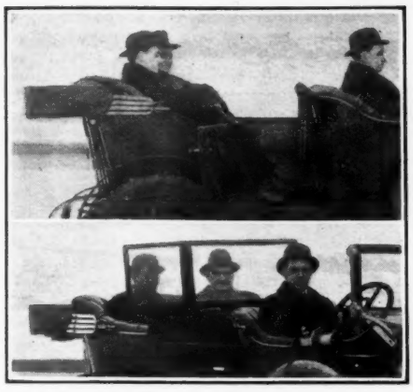


Fig. 6—Two views of J. H. Tonneau windshield

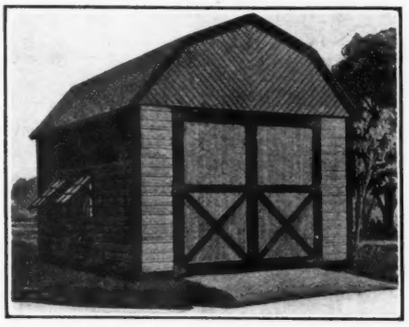


Fig. 7—Miller sectional garage

Flanders, has recently been brought out by the New-Lite Mfg. Co., Newton, Ia.

The New-Lite system consists of a belt-driven generator, a storage battery, head and tail lights, dash switch and the necessary wiring and fittings for installation. Drive is obtained by passing one belt over both generator and fan pulleys. The generator operates at 6 volts and is provided with an automatic cutout. The battery is designed to be carried on the running board and is housed in a steel box provided with a lock. The lights are finished in black and nickel, the headlights being 8.5 inches in diameter and are equipped with 15-candlepower Mazda bulbs. The rear light has a 2-candlepower globe. The price of this equipment is $40 and a pair of bullet side lamps are furnished for $6 extra.

The installation on a Ford is easily performed in 2 hours. The generator is suspended at the left side of the motor near the front by means of a plate that is bolted to the cylinder head.

Fig. 8—Prentiss six-party kitchenette

Lubrication of the Motor Car—Believing that there are many car owners who will appreciate enlightenment on this important subject, the N. Y. & N. J. Lubricant Co., manufacturers of Non-Fluid Oil and MoToRoL, has recently issued a revised edition of their booklet entitled "Lubrication of the Motor Car."

The problems of motor car lubrication are thoroughly covered, and the book is profusely illustrated with drawings of the different parts of the car. Among other things are some hints and suggestions as to the proper lubricants to use, and some simple tests for distinguishing the difference between the various grades.

A feature of this booklet is a complete lubricating chart inserted in the center. This chart shows at a glance every part of the car requiring lubrication, and listed in tabular form are the names of the different parts showing intervals at which lubricant should be applied.

A copy of this booklet may be secured by writing the N. Y. & N. J. Lubricant Co., 165 Broadway, N. Y., who will furnish same without charge, if this magazine is mentioned.

Jones Auto Lock—The Jones Auto Lock, Fig. 10, recently placed on the market, is an invention designed to control the passage of explosive mixtures to the cylinders, and cut off the flow of the mixture. The mechanism is so arranged that the passage leading from the carburetor to the engine cylinder may be closed when the owner leaves the machine, and the construction is such that only the owner or authorized person who knows the combination can open it.

So confident are the promoters of this lock as to the impossibility of any unauthorized person being unable to start the machine or pick the lock that they have a standing offer of $100 for any one who can open the lock.

The Jones Auto lock is a combination lock having a thousand different combinations and is operated by a knob on the dashboard, but has no numbered dial and has no tumblers.

A new manifold must be made and is cast in one piece with a conduit to receive the lock. In attaching lock to the machine, it will simply be necessary to remove the old manifold and put on the new manifold containing the Jones lock in its place.

Lightning Speed Indicator—The McDonnell Odometer Co., Kedzie avenue, Chicago, Ill.. has brought out a speed in-

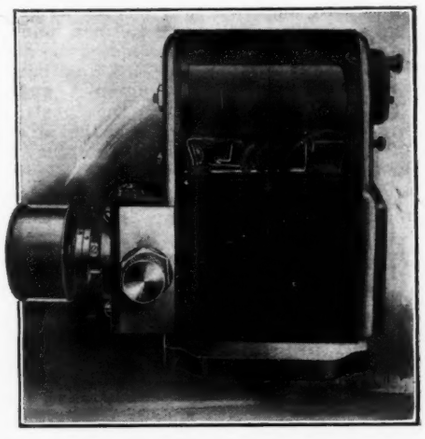


Fig. 9—New-Lite electric lighting generator

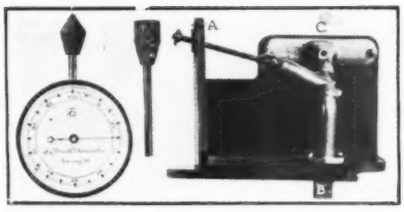


Fig. 10—Right—Jones Auto Lock acts on gas charge

Fig. 11—Left—Lightning speed indicator

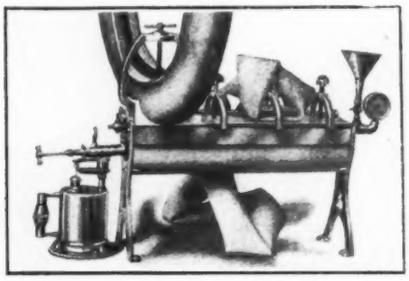


Fig. 12—Eureka garage vulcanizer

dicator or tachometer, Fig. 11, for measuring the speed of rotation of shafts. Its chief advantages are: easy running; compactness, can be carried in the pocket; light weight, it weighs 1.5 ounces.

Two types of rubber tips are furnished, one with pointed and one with flat ends, the former for shafts with cone centers and the latter for those with flat ends. The stock spindle is 2.5 inches in length and extra spindles up to 8 inches can be obtained at 25 cents each.

All metal parts are nickeled, the dial is white and each instrument is put up in a cloth case. It sells for $2 with cloth case and with leatherette case $2.50.

Eureka Garage Vulcanizers—Steam vulcanizers for the garage are made by the Des Moines Garage and Mfg. Co., Des Moines, Ia. One of the most interesting models is shown in Fig. 12. It is known as model 200. It is designed for one casing and three tubes. Heat is supplied by a blow torch and water is introduced through the funnel at the right. It weighs 42 pounds.

Complete instructions are sent with each machine.

Rothweiler Barrel Pump—A convenient barrel pump, for gasoline, kerosene and cylinder oil is shown in Fig. 13. Its installation is simple, as it is only necessary to bore a 1.5-inch hole in the top of the barrel and insert the suction tube of the pump. The pump is adjustable and is set to pump 1 quart. There is no brass used in the construction and therefore it is stated that it can be used for pumping all kinds of liquids without danger of corroding.

Metalcraft Offset Funnels—Two types of offset funnels, Fig. 14, especially adapted to filling rear tanks are made by William Vogel & Bros., Brooklyn, N. Y. The one at the left is provided with two sectional spout extensions 7 inches long and one offset below. It is stated that it will reach any rear pressure tank filler opening no matter how far under the car it may be. The special wedge shape of the body and the sectional spout with an extension capacity of 20 inches, makes it possible to reach under the body, or beside tires and tire-trunks or through the spokes of the rear wheel. Another type is shown at the right. The former is galvanized, has a ring top for a chamois skin and a fine brass wire cloth strainer over the outlet hole. The latter is heavily copper plated and is also provided with a ring top and brass mesh strainer. The price of both is $1.

Gasolock—The Headlight Support Co., Dime Bank Bldg., Detroit, Mich., is making a device, Fig. 16, for shutting off and locking the fuel supply, which is held to even eliminate the need of theft insurance. The locking apparatus is known as the Gasolock and is readily operated from the seat. By turning the thumb button the supply of gasoline to the carbureter is shut off and locked with a Yale lock, until the holder of the key releases the mechanism.

The manufacturer points out that the Gasolock presents several other practical features. It prevents the waste of

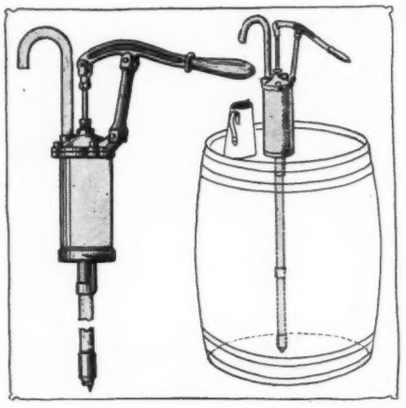


Fig. 13—Rothweiler barrel pump

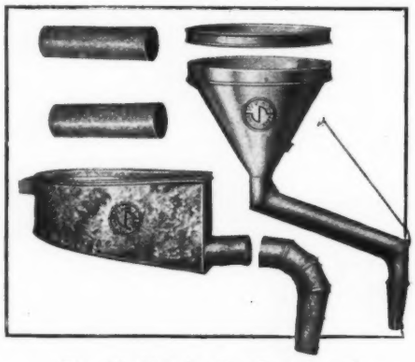


Fig. 14—Metalcraft offset funnels

fuel through a flooding carbureter, and in the event of the latter igniting due to a backfire, the supply of fuel can be immediately shut off, preventing severe loss.

The installation of the device into the gasoline pipe line is an easy matter, and has the advantage of being not only adaptable to the first car on which it is installed, but may be used again on any other machine. Two Yale keys are supplied with each lock and a third is kept by the Headlight Support Co., being filed away with the owner's number, so that in case both of the owner's keys are lost a telegram or a letter will bring the extra key without charge, by special delivery mail.

Gemco Ford Lock—An ignition lock, Fig. 17, that will prevent the theft of a Ford car is made by the Garage Equipment Mfg. Co., Milwaukee, Wis. It fits over the magneto plug and can be applied in 20 minutes. When the lock is in operation the plunger is moved down and the plug is short-circuited. The wire to the coil runs from the side of the case. The lock itself is of Yale manufacture and extends up through the foot boards just under the coil box.

To attach, remove the three screws from the magneto plug, pull both wires through the fiber bushing on the side of the lock and out through the bottom, and fasten to the magneto plug. Place the lock over the plug and screw the lock fast to the engine with the three special screws furnished. The price with two keys is $4.

New Firestone Products—The Firestone Tire & Rubber Co., Akron, O., has recently added generator tubing, pump tubing and horn bulbs to its list of accessory products. This concern is also prepared to furnish friction tape in 1, 2 and 4 ounce rolls, heretofore nothing smaller than ½ pound rolls having been made.

Pedersen Patented United Terminals—In the April 16 issue of THE AUTOMOBILE in describing Pedersen United Terminals for Ford cars the fact that these terminals are protected by broad and basic patents was not mentioned. This is worthy of note because the Pedersen company is prepared to prosecute all infringers.

Monarch Valve Grinder—A simple and effective valve grinding tool, Fig. 15, is manufactured by the Martin Mfg. Co., 511 Vine street, Cincinnati, O. It consists of a screwdriver that is rotated by a rack and pinion, the handle of the screwdriver remaining stationary while the shank turns. The thrust of the shank is taken by a ball situated in the handle. Two tips are provided, an ordinary screwdriver type and a spanner for Ford cars. The valve grinder lists at $1.50.

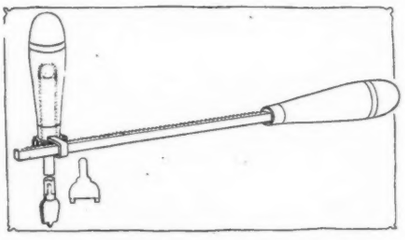


Fig. 15—Monarch valve grinder

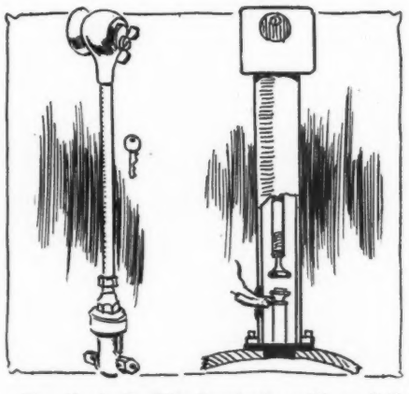


Fig. 16—Left—The Gasolock, cutting off the fuel supply. Fig. 17—Right—Gemco Ford lock, acting on the ignition